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1999

EPA Superfund
Record of Decision:

LONE STAR ARMY AMMUNITION PLANT
EPA ID: TX7213821831
OU 01
TEXARKANA, TX
08/31/1999

RECORD OF DECISION

OLD DEMOLITION AREA AT
LONE STAR ARMY AMMUNITION PLANT
TEXARKANA, TEXAS

Prepared for:

U.S. ARMY ENVIRONMENTAL CENTER
ABERDEEN PROVING GROUND, MARYLAND 21010

Prepared by:

AGEISS ENVIRONMENTAL, INC.
1900 Grant Street, Suite 1130
Denver, Colorado 80203

July 7,1999

Record of Decision
for the
Old Demolition Area
at
Lone Star Army Ammunition Plant

Prepared for:
U.S. Army Environmental Center
Aberdeen Proving Ground, Maryland 21010

Prepared by:
AGEISS Environmental, Inc.
1900 Grant Street, Suite 1130
Denver, Colorado 80203

June 7, 1999

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LIST OF ABBREVIATIONS/ACRONYMS

ACNA	Aquatic Risk-Based Concentration Not Available
AGEISS	AGEISS Environmental, Inc.
ARAR	Applicable or Relevant and Appropriate Requirement
Army	United States Army
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Chemical of Concern
CTE	Central Tendency Exposure
EPA	United States Environmental Protection Agency
ERA	Ecological Risk Assessment
FFA	Federal Facility Agreement
FFS	Focused Feasibility Study
FS	Feasibility Study
ft	foot or feet
HEAST	Health Effects Assessment Summary Tables
HHRA	Human Health Risk Assessment
IRIS	Integrated Risk Information System
kg	kilogram(s)
LSAAP	Lone Star Army Ammunition Plant
mg	milligram(s)
mm	millimeter(s)
MSL	Mean Sea Level
NA	Not Analyzed
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
ODA	Old Demolition Area
OSWER	Office of Solid Waste and Emergency Response
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RfD	Reference Dose
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
ROD	Record of Decision
RRAD	Red River Army Depot
SARA	Superfund Amendments and Reauthorization Act
SFNA	Oral Slope Factor Not Available
SWMU	Solid Waste Management Unit
TAC	Texas Administrative Code
TNRCC	Texas Natural Resource Conservation Commission
UCL	Upper Confidence Limit
USC	United States Code
UXO	Unexploded Ordnance
μg/L	micrograms per liter

DECLARATION

Declaration

SITE NAME AND LOCATION

Old Demolition Area at
Lone Star Army Ammunition Plant
Texarkana, TX

STATEMENT OF BASIS AND PURPOSE

This Record of Decision (ROD) presents the selected remedy for the Old Demolition Area (ODA) located at Lone Star Army Ammunition Plant (LSAAP), Texarkana, TX. The remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986 and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record pertaining to all remedial activity for the ODA site. Information repositories containing the administrative record are located at the Texarkana Public Library at 600 W. 3rd Street, Texarkana, TX; the Maud Public Library at Maud, TX; and at LSAAP.

The Texas Natural Resource Conservation Commission (TNRCC) concurs with the selected remedial action.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present a current or potential threat to public health, welfare, or the environment. The response action is referred to in this ROD as the selected remedy.

DESCRIPTION OF THE SELECTED REMEDY

This selected remedy addresses the source material at the ODA, a site that occupies approximately 17.4 acres in the south central portion of the 15,500 acre LSAAP. Source material is defined as residual munitions and propellant materials remaining from past ordnance activities. The ODA was used briefly for open detonation of off-specification munitions from 1943 to 1944. This abandoned detonation area was the final disposal location for the detonated munitions (a military landfill). Although LSAAP has other ongoing industrial activities, only the munitions detonated from 1943 -1944 (no additional munitions debris, nor any other industrial wastes) were disposed within the ODA.

The ODA was designated a Superfund site in 1987 and placed on the National Priorities List (NPL), due to concerns that chemicals from source material at the site may potentially be contaminating the environment.

After completion of the Remedial Investigation (RI), consideration of current land use/control and future land reuse plans, and assessing the risks to both human and ecological receptors, the United States Environmental Protection Agency (EPA), TNRCC, and the United States Army (Army) agreed that the ODA site characteristics, which include land disposal and unique safety, risk, and toxicity characteristics, were compatible with the presumptive remedy of containment identified for military landfills containing high-hazard military-specific wastes. Thus, the standard remedy of containment was chosen pursuant to EPA’s guidance, *Presumptive Remedy for CERCLA Municipal Landfill Sites*, Office of Solid Waste and Emergency Response (OSWER) Directive 9355.0-49FS, as well as EPA's interim guidance *Application of CERCLA Municipal Landfill Presumptive Remedy to Military Landfills*, OSWER Directive 9355.0-67 FS. Presumptive remedies are preferred technologies for common categories of sites, based on historical patterns of selecting remedies and EPA's scientific and engineering evaluation of performance data on implementing technology.

The NCP states that containment technologies will generally be appropriate remedies for wastes that pose a relatively low level threat or where treatment is impracticable. Containment has been identified in EPA's guidance “Application of the CERLCA Municipal Landfill Presumptive Remedy to Military Landfills" as the most likely response action where:

, Adequate information has been collected, including assessment of risk, to determine whether source containment is the appropriate remedy for the landfill

, Effects of land reuse plans on remedy selection were considered

, Site-specific factors such as hydrogeology, volume, cost, and worker safety affect the practicability of excavation of landfill contents

, Military-specific wastes may be present and more intrusive remedial activities may cause greater risk than leaving waste in place

This decision framework to evaluate applicability of the presumptive remedy to military landfills has been excerpted from EPA's "Application of CERCLA Municipal Landfill Presumptive Remedy to Military Landfills" and is illustrated in Figure D-1.

Containment is used as an engineering control because the source material poses a relatively low-level health or ecological threat and all other remedy options, which involve excavation, may pose significant safety hazards for site workers. To ensure the effectiveness of containing chemicals leached from the source material, groundwater and surface water monitoring will be performed. The selected remedy of containment referred to in this ROD as Soil Cover, Erosion Controls, and Monitoring Controls, includes the following major components:

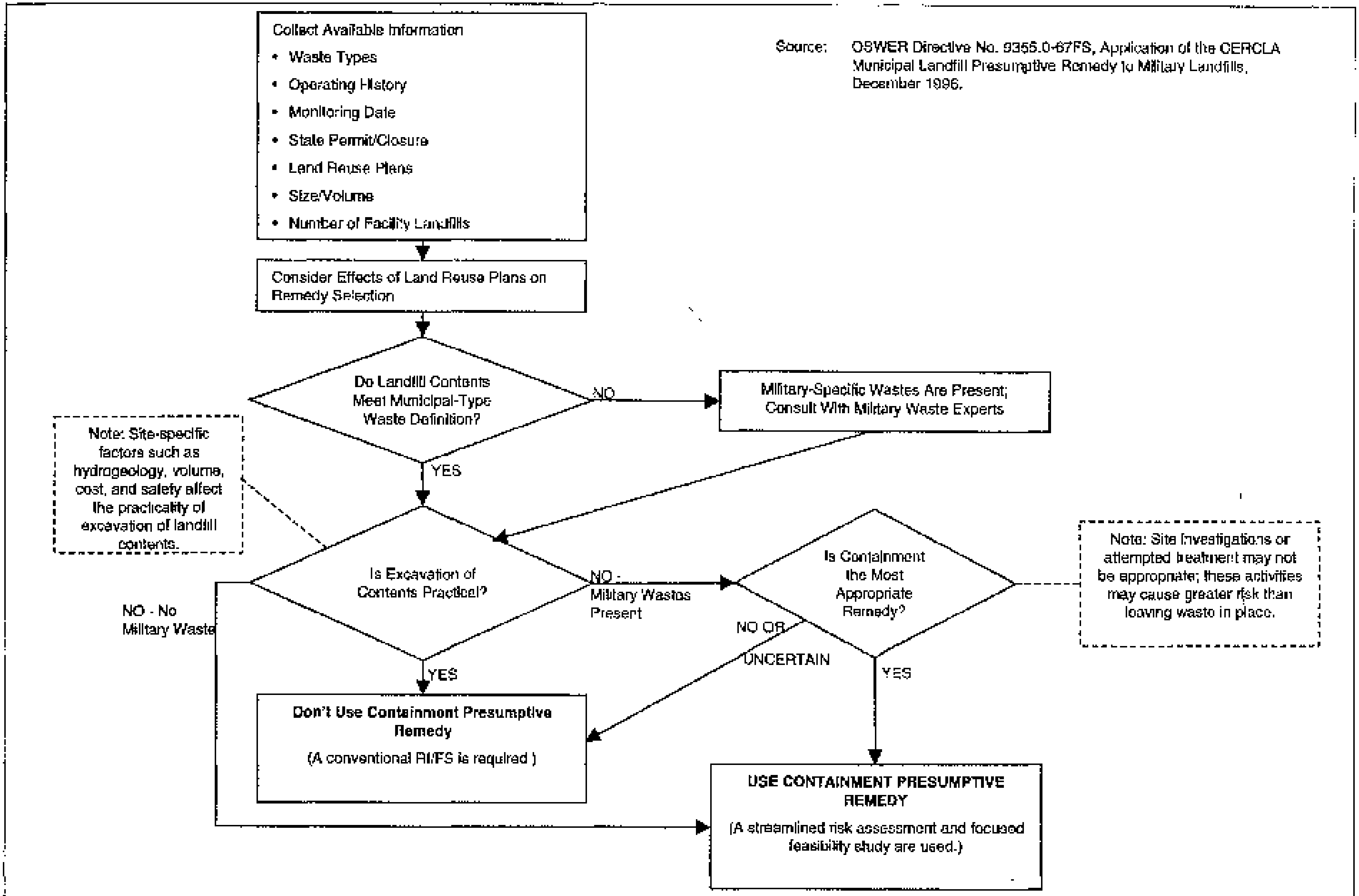
, Clearing surficially exposed source material

, Regrading, leveling, and placing a soil cover over the ODA

, Constructing erosion control berms along the northern and eastern ODA perimeters and within the site's interior

, Revegetating the soil cover and berms

, Implementing Institutional Controls: land use restrictions, access restrictions, posting of signs, fencing, and restrictions on the extraction and use of groundwater from the Study Area



Prepared for:
U.S. Army Environmental Center

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Figure D-1
Decision Framework

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- Installing additional monitoring wells (established as part of the groundwater monitoring program during the remedy design phase)

- Conducting periodic inspections of the soil cover, berms, and cable to identify any needed maintenance and performing maintenance

- Performing groundwater and surface water monitoring

- Evaluating the effectiveness of the selected remedy every 5 years

Other practical considerations in the selection of the containment remedy for the ODA are based on current control/use of land and future land reuse plans. The appropriateness of the selected containment remedy is based on:

- The Army having continued control of LSAAP, and therefore, limited public access

- Land use at LSAAP remaining commercial/industrial

- The land remaining in control of the Army until LSAAP is closed completely as decreed by the Army Headquarters at Rock Island, IL

EPA, TNRCC, and the Army agree that should any of the listed land uses change, the ROD would be re-opened and the ODA risk assessment would be re-evaluated for appropriate receptors.

STATUTORY DETERMINATIONS

The selected remedy is acceptable to TNRCC. TNRCC's concerns related to the selected remedy have been addressed. No waivers have been proposed in the selected remedy.

The selected remedy is protective of human health, welfare, or the environment; complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action; and is cost effective. The selected remedy utilizes engineering and institutional controls to the maximum extent practicable for this site. Because the site involves only a low level health or ecological threat, the statutory preference for treatment as a principal element of the remedy will not have to be met. Excavation of the source material would require removal of large volumes of soil (112,000 cubic yards), and the potential presence of unexploded ordnance may result in accidental detonation during such a remedial action, posing high safety hazards to remedial and site workers. This further supports a containment remedy.

The selected remedy will result in hazardous substances, pollutants, or contaminants remaining onsite above levels that allow for unlimited use and unrestricted exposure following completion of all remedial action; therefore, consistent with the NCP, a review will be conducted within five years after the commencement of the remedial action to ensure that the selected remedy continues to provide adequate protection of human health, welfare, or the environment. Such reviews will be repeated until contaminant levels allow for unlimited use and unrestricted exposure.

The containment remedial action was proposed on May 25, 1998 and the public comment period was closed on August 7, 1998. Public comments were reviewed and no changes to the proposed remedy were needed. No comments were received that suggested other alternatives should be considered.

DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary of the ROD:

, Chemicals of concern (COCs) and their respective concentrations

, Baseline risk represented by the COCs

, Compliance goals

, Current and future land use assumptions from the baseline risk assessment

, Land use that will be available at the site as a result of the selected remedy

, Estimated capital, operation and maintenance, and total present worth costs and the number of years over which the cost estimate of the remedy is projected

, Decisive factors that led to selecting the remedy

Clean-up levels have not been established and are not included in this ROD, since containment is the selected remedy.

SIGNATURE AND SUPPORT AGENCY ACCEPTANCE OF THE REMEDY

Larry V. Gulledge
6 July '99
Larry V. Gulledge
Deputy to the Commander
U.S. Army Industrial Operations Command

Date

Gregg A. Cooke
8-31-99
Gregg A. Cooke
Regional Administrator
United States Environmental Protection Agency

Date

Jeffrey A. Saitas
7/27/99
Jeffrey A. Saitas, P.E.
Executive Director
Texas Natural Resource Conservation Commission

Date

DECISION SUMMARY

Decision Summary

The Decision Summary is the main component of the ROD and provides an overview of the site-specific factors and analysis that led to the selection of the remedy for the ODA. This section describes the following elements:

- Site Name, Location, and Description
- Site History, Investigative, and Enforcement Activities
- Community Participation
- Scope and Role of the Response Action at the ODA
- Summary of Site Characteristics
- Current and Potential Future Site and Resource Uses
- Summary of Site Risks
- Remediation Objectives
- Description of Alternatives
- Summary of Comparative Analysis of Alternatives
- Selected Remedy
- Statutory Determinations
- Documentation of Significant Changes

1.0 SITE NAME, LOCATION, AND DESCRIPTION

The site that is the subject of this ROD is the ODA located at LSAAP near Texarkana, TX. The Comprehensive Environmental Response, Compensation and Liability Information System, known as CERCLIS, identification number is TX7213821831. A July 1990 Federal Facility Agreement (FFA) established the Army as the lead agency for the RI/Feasibility Study (FS) and subsequent clean-up, and the EPA and TNRCC as the regulatory oversight agencies.

This section describes the ODA location and the actual or potential threat from the ODA in the following sections:

- Site Location Site Description
- Site Description

1.1 SITE LOCATION

LSAAP is a government-owned, contractor-operated installation which performs and maintains the various functions necessary to load, assemble, and pack ammunition items for the Army. The installation occupies approximately 15,546 acres of land, of which approximately 12,300 acres are unimproved. LSAAP is located in Bowie County in northeastern Texas, approximately 12 miles west of Texarkana, TX (Figure 1-1). Communities in the vicinity of LSAAP include Hooks and Leary to the north, and Redwater and Maud to the south and southwest, respectively. The western boundary of LSAAP adjoins Red River Army Depot (RRAD); the southern boundary partially adjoins RRAD, with the remainder adjacent to Texas Road 991. The eastern boundary is bordered by privately-owned land, and the northern boundary adjoins U.S. Highway 82. A chain-link or barbed-wire fence encloses the entire installation.

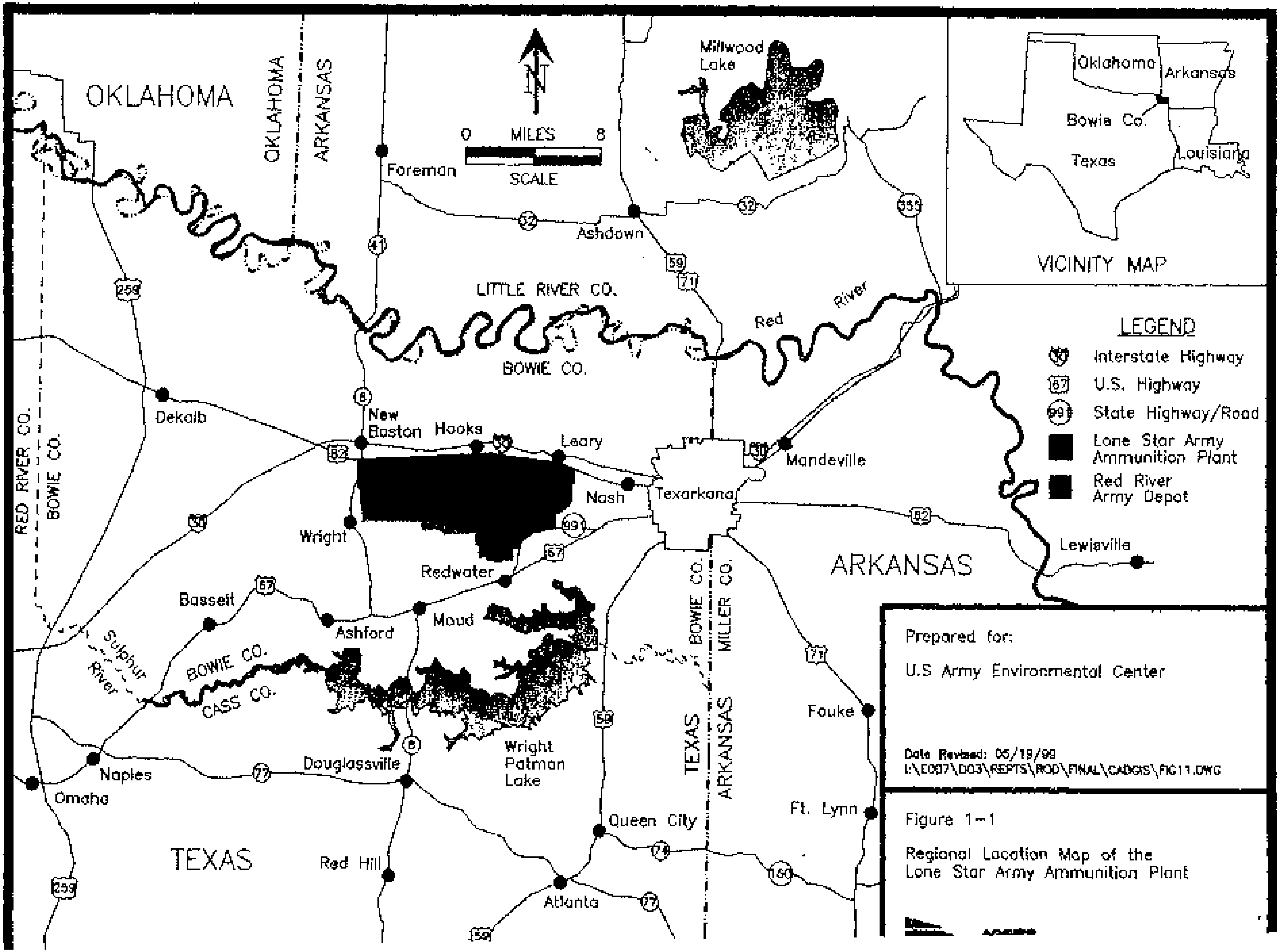


Figure 1-1

Regional Location Map of the Lone Star Army Ammunition Plant

The ODA, located in the south-central portion of LSAAP (Figure 1-2), is entirely contained within the installation boundaries and is fenced and posted. The fenced area encloses 17.4 acres and was used by the Army to detonate explosives during World War II. The fenced area and the area just outside the fence to the north, south, east, and west (hereafter referred to as the Study Area) were investigated during the RI, because ordnance debris could remain in these areas as a result of demolition activities.

1.2 SITE DESCRIPTION

Destruction of explosives no longer occurs at the ODA; however, residual munitions and propellant materials from past ordnance demolition activities are present at the ODA. This material is referred to as source material. It consists of metal fragments and associated bulk explosive materials from 20-millimeter (mm) and 37-mm rounds, fuzes, and boosters. This section provides an overview of the ODA's geography, topography, and surface water; and the geology and groundwater.

1.2.1 Geography, Topography, and Surface Water

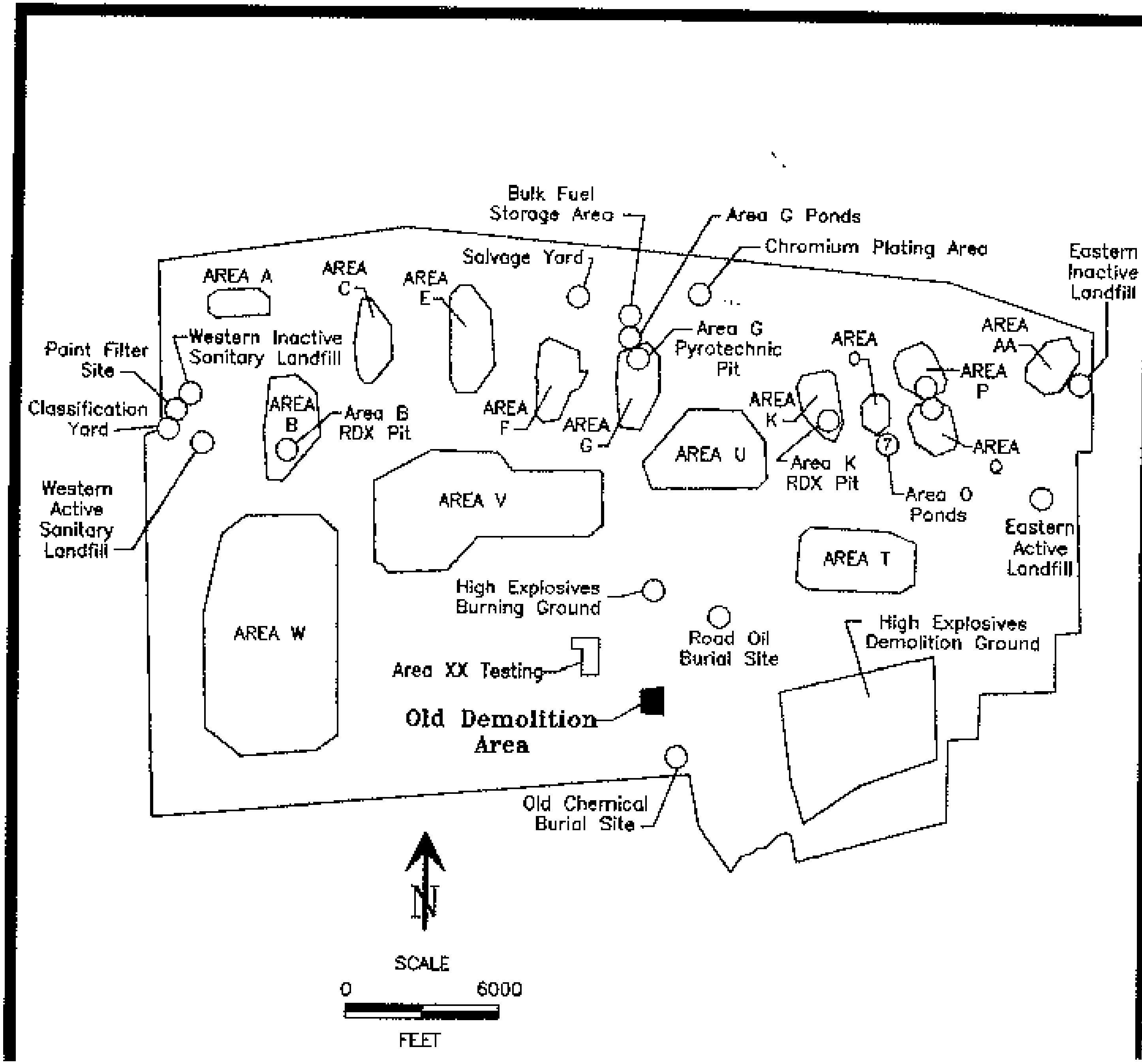
The ODA is predominately bare ground and grassland with woody vegetation (young pines and hardwoods) growing primarily around the perimeter. In general, the area immediately surrounding the ODA is heavily wooded.

A majority of the ODA is located on a broad hillside that slopes to the south-southeast at an average slope of 3 percent (Figure 1-3). Elevations range from 334 feet (ft) above mean sea level (MSL) along the west-central side of the ODA to 312 ft above MSL at the east-central side. No buildings are located In the vicinity of the ODA. There are power lines to the south and west and several culverts that convey flow in the south drainage beneath roads bordering the ODA.

The ODA lies within a surface water drainage basin of approximately 360 acres. Surface water in the area of the ODA originates from two sources: 1) groundwater which discharges to a seep area south of the ODA, and 2) overland flow from storm water runoff. Two intermittent drainages are located in the Study Area, one to the south and the other to the east of the ODA. The east drainage discharges into the south drainage. The south drainage continues for another 1,500 ft, to the confluence with East Fork Elliott Creek. Natural flow in East Fork Elliott Creek is intermittent, but discharge from LSAAP's wastewater treatment facility produces perennial flow in the creek. East Fork Elliott Creek flows in a southerly direction for approximately 1.2 miles before exiting LSAAP; then flows approximately 3.9 miles to the confluence with Wright Patman Lake (at normal pool elevation), about 5 miles south of the ODA. Due to the intermittent nature of the two drainages, the potential aquatic habitat of the south and east drainages is limited.

1.2.2 Geology and Groundwater

The Study Area is underlain by the Eocene-aged Wilcox Group and the Paleocene-aged Midway Group. The Wilcox Group was deposited in a deltaic environment; because of its depositional environment, the lithology of the Wilcox Group at the Study Area is heterogeneous and complex, consisting of sand units, silts, clays, and lignites. Transmissive units in the Wilcox Group are laterally and vertically discontinuous sands with varying amounts of silts and clays. The Paleocene-aged Midway Group, which was deposited in a shallow marine environment, is an impermeable clay that acts as a barrier to groundwater flow.



LEGEND

LSAAP Boundary

Plant Operation Areas

Source: Dames & Moore, 1991 (Modified)

Prepared for:

U.S. Army Environmental Center

Date Revised: 05/19/99

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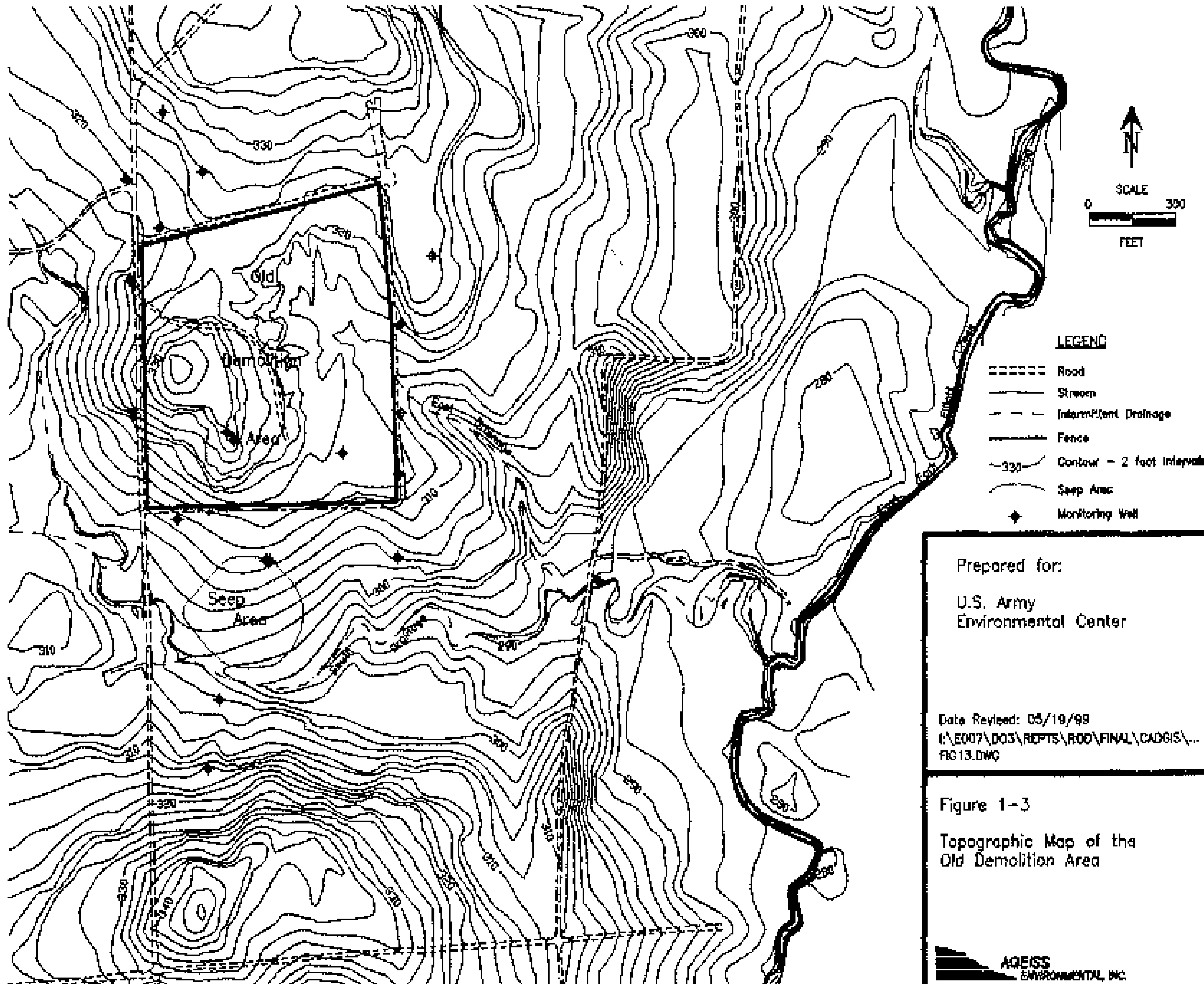
Figure 1-2

Location of the Old Demolition Area at the Lone Star Army Ammunition Plant



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Environmental Center

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Figure 1-3

Topographic Map of the Old Demolition Area

A single homogeneous aquifer does not exist at the Study Area based on lithologic, hydrologic and water quality data. Groundwater is present under both confined and unconfined condition and flows south to southeast. Groundwater flow velocity is variable, ranging from 0.001 to 1.8 per day, and vertical conductivity is low. The saturated thickness of the Wilcox Group in the Study Area is highly variable, ranging from 0 to over 30 ft.

2.0 SITE HISTORY, INVESTIGATIVE, AND ENFORCEMENT ACTIVITIES

This section provides the ODA's history and investigative activities in the following sections:

- Military Operational History
- Site Investigations
- Enforcement

2.1 MILITARY OPERATIONAL HISTORY

Prior to acquisition by the Army, the land that comprises LSAAP and RRAD was used for farming, grazing, and timber production. The construction of both LSAAP and RRAD began during mid-1941 and both were completed during the summer of 1942. Military activities began immediately upon completion, with LSAAP producing munitions, and RRAD shipping and storing munitions and conducting munitions training of troops. These activities continued until November 1945, when LSAAP and RRAD were combined and designated the Red River Arsenal, with a joint mission of demilitarization and renovation.

That joint mission continued until early 1951, when LSAAP actively resumed production of munitions, and RRAD resumed shipping and storing munitions and also started maintaining vehicles. The installations were no longer combined, and additional facilities were constructed at LSAAP. Production cutbacks began immediately after the Korean War ended in 1953 and continued through 1960. Most of the areas and facilities at both installations were inactive during this period. All activities increased again from 1964 to 1975 during the Vietnam War. However production has gradually declined from early 1969 to the present.

The ODA was established in 1943 and was used briefly for open detonation of off-specification munitions until it closed in 1944. From 1944 until 1951, explosives were destroyed at the RRAD demolition area. In 1951 a new demolition area was established at LSAAP about 1 mile northeast of the ODA. This new demolition area continues to be used today. No activity occurred at the ODA from 1944 to 1986. In 1986 the ODA was cleared of vegetation by the Army to expose, collect, and destroy explosive debris. Additional ordnance debris has since been exposed by erosion and can be observed on the surface.

2.2 SITE INVESTIGATIONS

This section provides the history of the RI conducted at the ODA under CERCLA.

The RI was performed in phases (Phase I through Phase IV). The Phase I investigation began in 1987 and addressed all the sites at LSAAP that had been previously identified as potentially contaminated, including the ODA. At the ODA, seven monitoring wells were sampled and two surface water and sediment samples were collected from East Fork Elliott Creek. Copper, mercury, zinc, and the explosives, 2,4,6-trinitrotoluene and tetryl, were identified as chemicals of potential concern. The Phase I investigation recommended that further groundwater investigations were needed.

The Phase II investigation began in 1990 and focused only on the ODA. Samples collected were 11 groundwater samples, 12 soil samples, and four surface water and sediment samples. Copper, mercury, zinc, chromium, lead, selenium, the explosives, 2,4,6-trinitrotoluene, RDX, and the breakdown product of explosives 1,3-dinitrobenzene were identified as chemicals of potential concern. The Phase 11 investigation recommended fencing the ODA and implementing an erosion control program. Additional groundwater monitoring wells, however, were required to characterize groundwater.

The Phase III investigation began in 1991. Although eight monitoring wells were installed, five were dry. In addition, four of the existing monitoring wells were plugged and abandoned. Samples collected were nine groundwater samples and six soil samples. Copper, mercury, zinc, chromium, lead, barium, the explosives, 2,4,6-trinitrotoluene, tetryl, RDX, and the explosive breakdown product, 1,3-dinitrobenzene were identified as chemicals of potential concern. The Phase III investigation recommended that the ODA be capped; however, further investigation of groundwater quality and of risks to both human and ecological receptors were required.

The Phase IV investigation began in 1994. Five new monitoring wells were installed. Samples collected were 38 groundwater samples, 69 soil samples, and four surface water and sediment samples. In addition, surface water and sediment samples were collected for aquatic toxicity testing, and ordnance debris samples were collected for analysis. Copper, mercury, zinc, chromium, lead, selenium, barium, cobalt, aluminum, vanadium, nickel, and the explosives, nitroclycerine and pentaterythritol tetranitrate were identified as chemicals of potential concern.

A summary of the results of the RI is provided in Sections 5.0, 6.0, and 7.0 of the Decision Summary.

After completion of the Phase IV RI, consideration of current land use/control and future land reuse plans, and assessing the risks to both human ecological receptors, the EPA, TNRCC, and the Army agreed that the ODA site characteristics were compatible with the presumptive remedy of containment identified for military landfills containing high-hazard military-specific wastes. A focused feasibility study (FFS), addressing the ODA as a military landfill, described the presumptive remedy for the ODA. The FFS was completed March 31, 1998. The Proposed Plan explaining the RI, FFS, and the proposed remedy at the ODA was distributed for public comment May 25,1998.

2.3 ENFORCEMENT

In July 1990, EPA, TNRCC, and the Army signed a FFA to cover the investigation, development, and implementation of response actions for all releases or threatened releases of hazardous substances, contaminants, hazardous wastes, hazardous constituents, or pollutants from the ODA. The FFA established LSAAP as a Federal facility and the Army as the "owner"or "operator" of LSAAP. EPA and TNRCC agreed to provide the Army with guidance to assist the Army in the performance of its requirements. The FFA established the documentation required for the remediation of the ODA and a mutually agreed to schedule.

To date, there have been no emergency response actions nor any imminent and substantial endangerment to the public health, welfare, or the environment.

3.0 COMMUNITY PARTICIPATION

This section describes how the public participation requirements in CERCLA Sections 113 and 117 were met. Throughout the RI/FS process, the Army has held quarterly Technical Review Committee meetings which were open to the public. The RI, FFS, and Proposed Plan for the LSAAP ODA were released to the public in January 1997, March 1998, and May 1998, respectively. These documents are available to the public in the administrative record at LSAAP and information repositories maintained at the Texarkana Public Library and Maud Public Library. A public comment period for the Army's proposed preferred remedy presented in the Proposed Plan was held from May 25, 1998 through August 7, 1998. In addition, a public meeting was held on July 7, 1998. Public notices of the Proposed Plan and the associated public meeting were placed in the Texarkana Gazette and the Citizen Tribune newspapers and run on KTOY-FM, STAR 107, KCMC, and KOWS radio stations. At the public meeting, representatives from the Army, EPA, and TNRCC answered questions about the ODA and the remedial alternatives under consideration. A transcript of the public meeting is available in the administrative record. A response to the comments received during the public comment period is included in the Responsiveness Summary, which is part of this ROD. The comments received during the public comment period indicate that the public has no objections to the proposed remedial alternative for the ODA as presented in the Proposed Plan. This ROD presents the Army's preferred remedy for the ODA chosen in accordance with CERCLA, as amended by SARA. The selected remedy meets the requirements of the NCP. The decision for this site is based on the documents contained in the administrative record.

4.0 SCOPE AND ROLE OF THE RESPONSE ACTION AT THE ODA

As with many Superfund sites, the environmental issues at LSAAP are complex The ODA is the only CERCLA site at LSAAP that is addressed in the ROD. Because LSAAP is an active Army ammunition plant, all other areas of potential concern are managed under the Resource Conservation and Recovery Act (RCRA) program as solid waste management units (SWMUs). All of the other areas of potential concern at LSAAP are identified in Figure 1-2. The selected remedial action authorized by this ROD prevents future exposure to the source material at the ODA, minimizes infiltration and the resulting leaching of source material chemical to groundwater, and controls soil erosion within the ODA. The selected remedy removes the source material that has become surficially exposed due to soil erosion at the ODA. This material represents only a small quantity of the total ordnance debris that is disposed in place (embedded) in the ODA subsurface soils. This clearing of the surficially exposed ordnance is necessary to facilitate the safe placement of the erosion control and soil cover components of the remedy. This material will be removed by hand by appropriately trained explosive ordnance specialists. The source material that is removed will be transported to the High Explosives Demolition Ground at LSAAP for destruction by detonation. The High Explosives Demolition Ground is an interim status RCRA treatment facility. The ODA will then be regraded and leveled as needed. A 24-inch soil cover will be placed over the ODA. Bidirectional erosion control berms will be constructed. The soil cover and erosion control berms will be re-vegetated. To ensure the effectiveness of the selected remedy, groundwater and surface water monitoring will be performed.

The selected remedy is based on continued Army control of LSAAP, and therefore, limited public access. The Army Headquarters at Rock Island, IL has decreed that the land will remain in control of the Army until LSAAP is closed completely. If LSAAP is closed or if land use is proposed to change from commercial/industrial, the ROD would be re-opened and the ODA risk assessment would be re-evaluated for appropriate receptors.

5.0 SUMMARY OF SITE CHARACTERISTICS

This section provides an overview of contamination at the ODA and the actual and potential pathways of exposure by the conditions at the ODA. This overview describes the assessments made during the RI that characterized the site, its environment, and the extent of contamination. This section also includes general information about the chemicals at the ODA for the following environmental media, potential pathways of contaminant migration, and pathways of exposure at the ODA, and any site-specific factors that may affect the remedy:

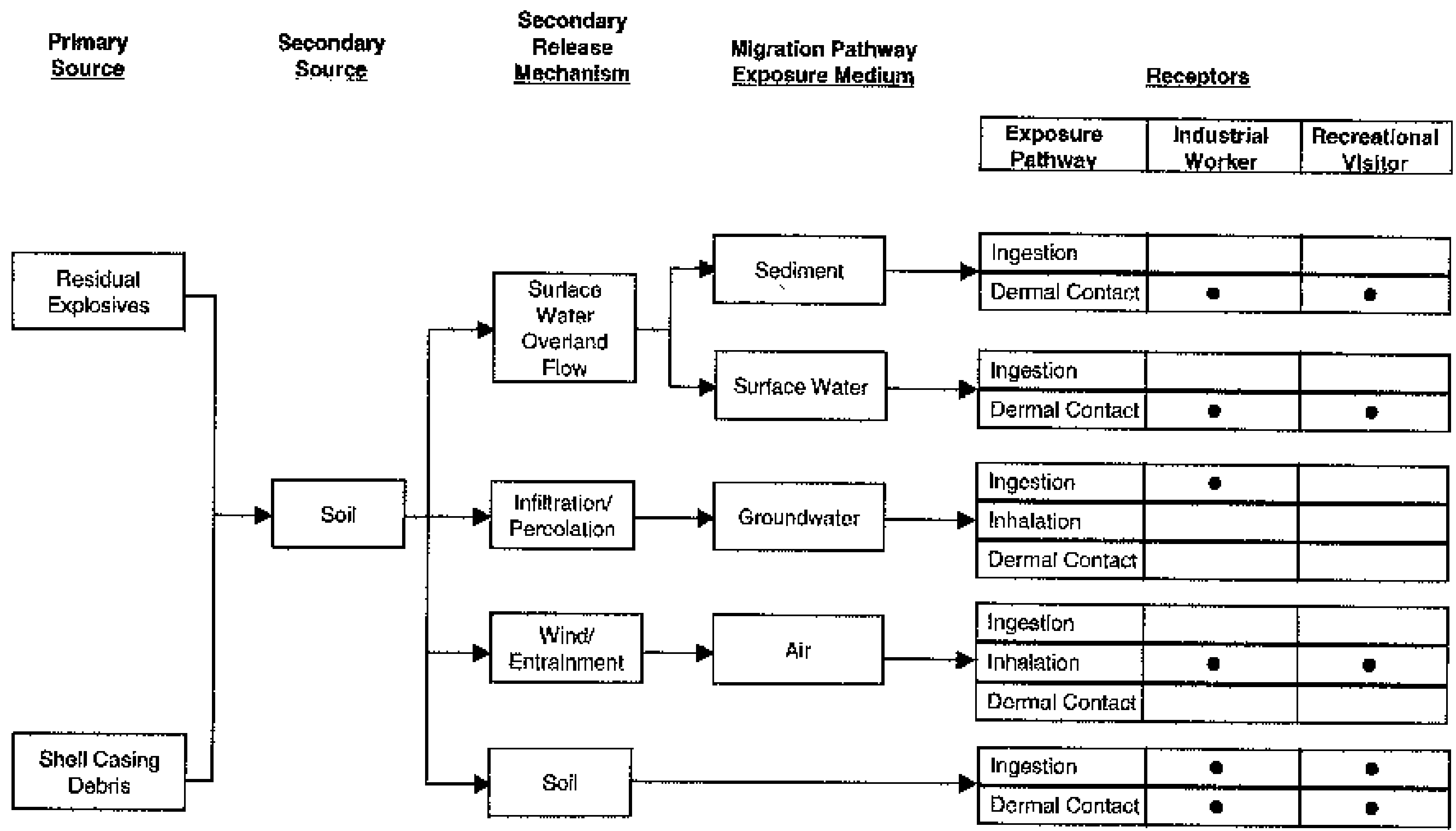
- Source Material
- Surface Water and Sediment
- Soil
- Groundwater

Figure 5-1 shows the conceptual site model of the ODA. The transport pathways relevant to fate and transport of chemicals at the Study Area are those shown on the conceptual site model and discussed in this section. Transport is the movement of chemicals between different media and movement of media and/or chemicals between physical locations. Fate is the final disposition of chemicals. Chemicals with complete pathways (i.e., chemicals that are at the pathway start point, midpoints if they exit, and end point) and that are related to transport from source material, and those chemicals with an incomplete pathway but related to source material are summarized for each environmental media.

Table 5-1 identifies all organic chemicals detected and those inorganic chemicals reported above background or reference values. Chemicals detected in the environmental media that are related to the source material are highlighted.

Background values for surface water, sediment, and soil samples were collected from locations believed to be representative of local natural conditions. These values were reported in a separate LSAAP background report. All samples were collected at locations on LSAAP upgradient of the SWMUs. Results from the samples were statistically evaluated to obtain a background value for each chemical. The chemicals analyzed in the Phase IV RI soil were more extensive than the chemicals analyzed for soil in the background study. When there was no background value for a chemical in soil, the sediment background value for that chemical was used. Soil and sediment background values are believed to be similar because the soil and sediment parent material are believed to be the same.

Background values for groundwater could not be established. Groundwater wells selected as background wells were sampled during the Phase IV RI. Organic chemicals were detected in the wells selected as background wells, suggesting that groundwater had been affected by past activities. Analytical results from one well located in an undeveloped area of LSAAP were used as chemical values to compare to the groundwater at the ODA. These values are called reference values because the groundwater from the reference well had been minimally affected by past activities at LSAAP.



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U.S. Army Environmental Center

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Figure 5-1
Human Health Risk Assessment Conceptual Site Model

AGEISS ENVIRONMENTAL, INC.

Chemical	Source Material	Soil		Groundwater		Surface Water		Sediment	
	Phase IV	Historic	Phase IV	Historic	Phase IV	Historic Overland Flow	Phase IV Seep	Historic Overland Flow	Phase IV Seep
Explosives									
1,3-Dinitrobenzene	"	"	"	!	"	"	"	"	"
2,4-Dinitroluene	"	"	"	!	!	"	"	"	"
2,4,6-Trinitrotoluene	!	!	"	!	"	"	"	"	"
2-Amino-4,6-dinitrotoluene	NA	NA	"	NA	!	NA	"	NA	"
4-Amino-2,6-dinitrotoluene	NA	NA	"	NA	!	NA	"	NA	"
HMX	NA	NA	"	!	"	!	"	NA	NA
Nitroglycerine	NA	NA	!	NA	!	NA	"	NA	"
Pentaerythritol tetranitrate	NA	NA	"	NA	!	NA	"	NA	"
RDX	"	"	"	!	"	!	"	"	"
Tetryl	!	!	"	!	"	"	"	"	"
Volatile Organic									
1,1,1-Trichloroethane	NA	"	NA	!	"	"	"	"	"
1,2-Dichloroethane	NA	"	NA	"	"	!	"	"	!
Acetone	NA	"	NA	"	"	"	"	"	"
Benzene	NA	"	NA	"	"	!	"	"	"
Carbon disulfide	NA	"	NA	!	!	!	"	"	"
Carbon tetrachloride	NA	"	NA	!	"	"	"	"	"
Chlorobenzene	NA	"	NA	"	"	!	"	"	"
Chloroform	NA	"	NA	!	!	"	"	"	"
Chloromethane	NA	"	NA	"	!	"	"	"	"
Methylene chloride	NA	"	NA	"	!	"	"	"	"
Methyl isobutyl ketone	NA	"	NA	"	!	"	"	"	"
Trichloroethlyene	NA	"	NA	!	"	"	"	"	"
Trochlorofluoromethane	NA	"	NA	!	"	"	"	"	"
Semivolatile Organic Compounds									
Benzyx alcohol	NA	"	NA	!	!	"	"	"	"
Bis(2-ethylhexyl) phthalate	NA	"	NA	!	!	"	"	"	"
Metals (Inorganic Compounds)									
Aluminum	!	!	!	NA	!	"	"	"	"
Antimony	!	"	"	NA	"	"	"	"	"
Barium	!	"	"	NA	!	"	"	"	!
Beryllium	"	"	"	NA	"	"	"	"	"
Cadmium	!	"	!	NA	"	"	"	"	"
Calcium	!	"	!	NA	!	"	"	"	!
Chromium	!	!	!	NA	!	"	"	"	"
Cobalt	!	"	!	NA	!	"	"	"	!
Copper	!	!	!	NA	!	"	"	"	!
Iron	!	!	!	NA	!	"	"	"	!
Magnesium	!	!	"	NA	!	"	"	"	"
Manganese	!	"	!	NA	!	"	"	"	"
Molybdenum	!	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	!	"	!	NA	!	"	"	"	!
Potassium	!	"	!	NA	!	"	"	"	"
Silver	"	!	"	NA	"	"	"	"	"
Sodium	!	"	"	NA	!	"	"	"	!
Thallium	!	"	"	NA	"	"	"	"	"
Vanadium	"	!	!	NA	!	"	"	"	"
Zinc	!	!	!	NA	!	!	"	!	!
Arsenic	!	"	"	NA	!	"	"	"	"
Lead	!	!	!	NA	"	!	"	"	"
Selenium	!	!	!	NA	"	"	"	"	!
Mercury	!	!	!	NA	"	!	"	!	!

NA Not Analyzed
Absent in media
Present in media

NOTE: Chemical with black highlights reflect chemicals detected in the environment that are related to source material.

Detections on Table 5-1 are summarized for both historic samples (collected prior to the Phase IV RI) and Phase IV samples. Phase IV data are presented separately from historic data, because it is the most representative of current conditions in the Study Area. Phase IV data are discussed in the following sections.

Site investigations indicated that actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in the ROD, may present a current or potential threat to public health, welfare, or the environment.

5.1 SOURCE MATERIAL

Tetryl and 2,4,6-trinitrotoluene were the only explosives detectea in the source material, with tetryl most frequently reported. Aluminum, copper, iron, lead, manganese, and zinc were detected in all samples and are the predominant metals in the source material based on reported weight percentages. All other detected metals were reported at significantly lower percentages.

The predominant ordnance debris is 20-mm projectile fragments. All locations where ordnance debris is present are in the ODA with two exceptions. These exceptions were observations of sparse ordnance debris north and northeast of the ODA. Distribution of source material at the surface within the ODA does not appear to be uniform, being abundant In some cleared areas and sparse to nonexistent in some revegetated areas. This may reflect either higher visibility or increased erosion of surface soils in the cleared areas of the ODA.

5.2 SURFACE WATER AND SEDIMENT

With the exception of one detection of acetone in sediment, organic chemicals were not detected in Phase IV surface water and sediment samples. No inorganic chemicals are present above background values in surface water samples. The following inorganic chemicals were detected in Phase IV sediment samples outside the ODA above background values: barium, calcium, cobalt, copper, nickel, sodium, zinc, mercury, and selenium.

Other than the seep area south of the ODA, the extent of surface water is limited to an area approximately 600 ft in length along the south drainage, south of the ODA. During the Phase IV field program, surface water was observed to be present as a sequence of stagnant pools. This portion of the south drainage defines the extent of chemicals in surface water that may be related to the ODA.

Transport of source material to surface water and sediment by overland flow, including transport to soil as a midpoint and sediment-surface water interaction, takes place by dissolution of chemicals from soil and source material by surface water overland flow (Figure 5-1). Chemicals listed in Table 5 -1 for which the pathway from source material to surface water is complete or can only be related to source material as shown by historic overland flow data include:

- Metals - Lead, mercury, and zinc
- Explosives - HMX and RDX

Chemicals listed in Table 5-1 for which the pathway from source material to sediment via overland flow is complete include zinc and mercury as detected in historic data. The physical pathway for surface water and sediment is limited by the relative infrequency of overland surface water flow, estimated to be less than 30 days per year based on precipitation and surface water gaging data.

Transport of source material to surface water and sediment also occurs by groundwater discharge to the surface water, including transport to soil and groundwater as midpoints and sediment-surface water interaction (Figure 5-1). Chemicals listed in Table 5-1 for which the pathway from source material to surface water by groundwater discharge is complete or can only be related to source material as shown by historic data include:

- Metals - Zinc
- Explosives - HMX and RDX

Transport of chemicals to sediment by groundwater discharge to the surface involves adsorption/desorption processes between water and seep sediment, and precipitation of chemicals from water in response to changing conditions at the surface. Chemicals listed in Table 5-1 for which the pathway from source material to sediment is complete include cobalt, copper, and zinc as shown in Phase IV sediment data collected at the seep.

5.3 SOIL

Nitroglycerine is present in surface soil and in one subsurface soil sample, with the concentration decreasing with depth. All detections of nitroglycerine were within the ODA. The following metals were detected above their respective background value in more than two Phase IV surface soil samples: aluminum, cadmium, chromium, copper, iron, vanadium, zinc, lead, selenium, and mercury. In surface soil, copper, lead, zinc, and mercury have the largest extent of detections above backdround values.

Thirteen inorganic chemicals are present in Phase IV subsurface soil at concentrations above their respective background value. Aluminum, vanadium, and mercury have the largest number of detections above background values.

Transport of source material to soil, including transport between surface soil and subsurface soil, is via leaching, oxidation, and degradation of chemicals in source material. Transport from surface soil to subsurface soil is a complex iterative process involving dissolution of chemicals in the presence of water with subsequent transfer of chemicals via adsorption, ionic transfer, or precipitation to soil. Infiltration of precipitation and movement of water through the zone above the water table is the primary mechanism for this transport pathway. Chemicals listed in Table 5-1 for which the pathway from source material to soil is complete or can only be related to source material include:

- Metals - Cadmium, chromium, cobalt, copper, lead, mercury, selenium, and zinc
- Explosives - Nitroglycerine, 2,4,6-trinitrotoluene, and tetryl

The inorganic chemicals, except mercury, were derived from ordnance casings through leaching and oxidation of metal components. Mercury is probably derived from mercury fulminate primer material and was originally dispersed as an aerosol when off-specification ordnance was detonated at the ODA. Tetryl and 2,4,6-trinitrotoluene were detected in historic surface soil samples and in source material. Nitroglycerine was detected in Phase IV soil samples, but could not be analyzed in the source material samples. Nitroglycerine is not naturally occurring and must be related to the source material.

5.4 GROUNDWATER

Pentaerythritol tetranitrate and nitroglycerine are the most commonly detected explosives in Phase IV unfiltered groundwater samples. These, and other explosives, are detected in groundwater sporadically. For example, there are five wells to the south of the ODA. Each well was sampled twice during the Phase IV RI. Nitroglycerine was detected during only one sampling event in only two of the wells. The monitoring wells sampled during the Phase IV RI are shown in Figure 1-3.

Volatile organic compounds and semivolatile, organic compounds were detected in the four wells in which they were analyzed. Background groundwater could not be evaluated due to detections of organics in background wells. However, a reference well was selected for the Study Area. The following metals were present in Phase IV dissolved samples of groundwater above reference values: chromium, cobalt, copper, nickel, vanadium, zinc, and arsenic. The presence of metals in dissolved Phase IV groundwater samp!es is limited and distribution is limited to wells which are either in or immediately adjacent to the ODA.

Transport of source material to groundwater, including transport to soil as a midpoint, occurs by infiltration of precipitation through the zone above the water table, adsorption, and desorption of chemicals between groundwater and saturated materials, and leaching of naturally occurring chemicals in the saturated materials. Chemicals listed in Table 5-1 for which the pathway from source material to groundwater is complete or can only be related to source material include:

, Metals - Chromium, cobalt, copper, and zinc

, Explosives - Nitroglyce~jne, 2,4,6-trinitrotoluene, tetryl, RDX, HMX, pentaerythritol tetranitrate, 2,4-dinitrotoluene, 1,3-dinitrobenzene, 2-amino-4,6-dinitrotoluene, and 4-amino-2,6-dinitrotoluene

Chromium, cobalt, copper, and zinc have not migrated substantially in groundwater; detections of these chemicals in groundwater are within or immediately around the fenced perimeter of the ODA.

The ability of organic and inorganic chemicals to migrate is reduced at the Study Area because of the generally low hydraulic conductivities and the discontinuous nature of the water-bearing zones in this area. Explosives were detected erratically in groundwater throughout the Study Area. The presence of 2-amino-4,6-dinitrotoluene and 4-amino-2,6-dinitrotoluene associated with 2,4,6-trinitrotoluene in one well suggests that biotransformation of 2,4,6-trinitrotoluene is occurring in groundwater. Nitrotoluene and nitrobenzene group explosives are more mobile in groundwater than inorganic chemicals. This mobility is consistent with the lateral extent of detections of explosives relative to inorganic chemicals across the Study Area.

The selected remedy will minimize infiltration (as anticipated by 30 Texas Administrative Code (TAC) Chapter 330, Subchapter J) and resulting leaching of chemicals from source material to groundwater. Groundwater and surface water will be monitored for explosives to ensure protection of human health, welfare, or the environment.

6.0 CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

There are no current or future, site or resource uses for the ODA. LSAAP will continue all functions necessary to load, assemble, and pack munition items for the Army. No change in this land use is projected to occur at LSAAP for the next 15 years.

Non-Army uses of LSAAP include two 5-year industrial leases, American Dehydrated Foods and Lone Star Railcar Storage. Lessees are restricted to their designated areas of LSAAP. Lessees' designated areas are at least 2 miles from the ODA. They have been informed that there is an NPL site within the confines of LSAAP. There are currently no grazing or other agricultural leases at LSAAP.

Timber management and production is an important program at LSAAP and includes logging, reforestation, and controlled burns. The timber program is managed by RRAD. RRAD consults the LSAAP Environmental Off ice before instituting any management plan. No timber harvesting or controlled burns are allowed within the ODA. Timber management and production will continue to be important and are expected to remain at current levels for the next 15 years. Hunting at LSAPP is an authorized recreational activity for LSAAP and RRAD employees only. Although trapping is still allowed, it has not occurred in several years.

While rural residences are scattered throughout the area surrounding LSAAP, there is only one residential cluster south of the ODA. The residential cluster consists of approximately fifteen mobile homes and lies approximately 1.75 miles south of the LSAAP boundary. A well survey J conducted in 1995 identified 57 water wells within 2 miles of the LSAAP boundary, however, no wells were identified within 2 miles of the ODA. It is expected that area residents will continue using the private land adjacent to LSAAP for rural residences, cattle grazing, and timber production.

7.0 SUMMARY OF SITE RISKS

Both a Human Health Risk Assessment (HHRA) and an Ecological Risk Assessment (ERA) were conducted and reported in Chapters 7.0 and 8.0 of the Phase IV RI, respectively. This section describes the exposure pathways and risks so that risk reduction resulting from the selected remedy is related directly to the exposure pathways and baseline risks.

Baseline risk assessments develop risk estimates for exposure to chemicals present on the site as it currently exists without implementing interim or final remedial measures and without institutional controls. Both the HHRA and the ERA concluded that actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present a current or potential threat to public health, welfare, or the environment.

This description and summary of risks to support the selected remedy are presented in the following sections:

, Human Health Risks
, Environmental Risks

7.1 HUMAN HEALTH RISKS

The HHRA is an estimate of the level of risk that may be experienced by individual human receptors exposed to a site under a number of exposure scenarios. To quantify potential risks, dose or intake estimates for each chemical of potential concern are combined with toxicity values for each chemical of potential concern to provide risk estimates. The HHRA for the Study Area evaluated human health risks that may be associated with chemicals released to the ODA from source material.

This section briefly summarizes the elements of the HHRA and supports the basis for the remedy in the following sections:

- Chemical Identification
- Exposure Assessment
- Toxicity Assessment
- Risk Characterization
- Summary of Risk Uncertainties
- Conclusions of the HHRA

7.1.1 Chemical Identification

This section briefly describes the following elements of risk assessment at the ODA:

- Media of concern
- Chemicals of poteptial concern

The conceptual site model for the Study Area, which demonstrates that soil, sediment, surface water, groundwater, and air are all potential exposure media is presented in Figure 5-1. The conceptual site model identifies the pathways that were quantified in the HHRA.

Chemicals of potential concern selected for evaluation in the HHRA were all chemicals detected during the Phase IV RI except for chemicals considered essential nutrients. Tetryl and 2,4,6-trinitrotoluene, detected in soil during the Phase III RI, were also considered in the HHRA. These chemicals are identified in Table 5-1.

7.1.2 Exposure Assessment

This section briefly discusses the following elements of the exposure assessment.

- Potentially exposed populations - Selection of receptors or potentially exposed populations for the HHRA were based on The Area Development Land Use Report which is Appendix H of the RI Report. The Area Development Land Use Report determined that no change in land use would occur at LSAAP for the next 15 years. Therefore, a future industrial worker and a recreational visitor who is also an employee of LSAAP were selected as potential human receptors in the Study Area.

- Exposure pathways - The conceptual site model (Figure 5-1) identifies exposure pathways for chemical movement from the source material to human receptors. It graph ically displays how chemicals migrate from a source to an individual receptor and enter the body to represent risk to an individual. For an exposure pathway to be complete there must be a source, a transport mechanism, a point of exposure, and a route ofentry into the body. Exposure pathways identified for potential exposure to chemicals were:

- Incidental ingestion of and dermal contact with soil
- Incidental ingestion of groundwater from the water bearing zones in the Wilcox Group
- Inhalation of fugitive dust
- Dermal contact with sediment
- Dermal contact with surface water

, Exposure point concentrations - Exposure point concentrations, or estimates of the chemical concentration a receptor might come in contact within the Study Area through sediment and surface water, soil, and groundwater, were developed as part of the HHRA. This concentration is the lower of the 95 percent upper confidence limit (UCL) of the mean or the maximum detected concentration. These exposure point concentrations assume that the chemical concentration present at the time of the RI represents the chemical concentrations over the assumed exposure period.

Both historic and Phase IV data were considered when developing the exposure point concentrations for sediment, surface water, and soil. Data used to develop exposure point concentrations for surface water and sediment were usually maximum values found in these media. The maximum concentration found was used because the amount of data collected could not be used to provide a reasonable 95 percent UCL of the mean. For soil, the exposure point concentration is best represented by the 95 percent UCL of the mean of the data available.

Phase IV groundwater data were used to develop exposure point concentrations for groundwater. These data are from unfiltered groundwater samples and the data have been reduced to provide a 95 percent UCL of the mean for the data.

, Exposure frequency assumptions - Major assumptions about exposure frequency and duration included in the exposure assessment are discussed for the two exposure scenarios addressed by the risk assessment. For the industrial scenario, the Central Tendency Exposure (CTE) and the Reasonable Maximum Exposure (RME) were calculated and for the recreational scenario a RME scenario was derived. The CTE is an estimate of the exposure that is expected to occur most of the time. The RME is an estimate of the maximum exposure that is reasonably expected to occur at the site. The exposure assumptions used in these calculations are generally EPA default exposure assumptions and are provided in EPA guidance, with the exception of the adult worker inhalation rate. For both an industrial and a recreational receptor, an inhalation rate of 20 cubic meters per day was assumed. However, it was assumed that each receptor would only be present for 8 hours per day on the Study Area during their respective exposure days to inhale fugitive dust.

7.1.3 Toxicity Assessment

This section describes how cancer slope factors and reference doses (RfDs) used in the HHRA were developed, discusses intake estimates, and provides a brief explanation of the toxicity information used in the risk assessment.

Cancer slope factors have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. Cancer slope factors, which are expressed in units of (milligrams/kilogram-day)$^{-1}$ (mg/kg-day)$^{-1}$, are multiplied by the estimated intake of a potential carcinogen, in mg/kg-day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at the intake level. The term “upper-bound" reflects the conservative estimate of the risks calculated from the cancer slope factor. Use of this calculation makes underestimating the actual cancer risk, highly unlikely. Cancer slope factors are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolations and uncertainty factors have been applied.

RfDs have been developed by EPA for indicating the potential for adverse health effects from exposure to chemicals exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg-day, are estimates of lifetime daily exposure levels for humans, including sensitive individuals. Estimated intakes of chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans.) These uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur.

Intake estimates were developed using *Risk Assessment Guidance for Superfund* and the *Supplemental Region VI Risk Assessment Guidance*. Intake estimates were developed for both carcinogenic and noncarcinogenic compounds for the RME expected to occur at the ODA and the CTE that is expected to occur most of the time for the future industrial worker and for the RME for the recreational visitor.

The degree of confidence ascribed to a toxicity value is a function of both the quality of the individual study from which it was derived and the completeness of the supporting database. Verified toxicity values used in the HHRA were from EPA's Integrated Risk Information System (IRIS) or Health Effects Assessment Summary Tables (HEAST). However, for nitroglycedne, 2-amino-4,6-dinitrotoluene, and 4-amino-2,6-dinitrotoluene no officially verified toxicity values existed. Therefore to conduct risk assessment calculations for these chemicals, EPA provided provisional toxicity values, values which have not been evaluated and formally accepted by the EPA.

7.1.4 Risk Characterization

Potential total risks were estimated for both RME and CTE scenarios for a future industrial worker and an RME scenario for a recreational visitor. Total risk includes risk from all exposure pathways identified for the ODA. Potential estimated total risks to the CTE scenario for a future industrial worker and the RME scenario for a recreational visitor were within EPA's acceptable risk range of between 1 in 10,000 and 1 in 1,000,000. Potential total risks for the RME future industrial worker were greater than 1 in 10,000. This potential total risk is considered excessive risk by EPA and TNRCC. The total risk at the ODA is associated with potential exposure to nitroglycerine, arsenic, and bis(2-ethyl hexyl)phthalate in groundwater, and nitroglycerine in soil. Arsenic risks are the same from reference groundwater as they are from Study Area groundwater. Bis(2-ethylhexyl)phthalate is a common laboratory contaminant that may have been introduced during the laboratory analysis of samples and is unlikely to be attributable to the source material at the ODA.

Potential carcinogenic risks from nitroglycerine in groundwater, which has only a provisional toxicity value, for the RME future industrial worker is approximately 9.3 in 100,000. The potential carcinogenic risks from nitroglycerine in soil for an RME scenario for a future industrial worker is approximately 1.4 in 100,000. Because the selected remedy eliminates potential carcinogenic risks from soil, the remaining risk from groundwater is within EPA's acceptable risk management range. The TNRCC agrees that the selected remedy complies with the requirements of the Texas Risk Reduction Rules (30 TAC Chapter 335, Subchapter S).

7.1.5 Summary of Risk Uncertainties

Uncertainties associated with the quantitative risk characterization for the ODA in the HHRA are summarized in this section. The EPA and TNRCC agree that the selected remedial action for the ODA would implement sufficient remedies to address these uncertainties identified in the HHRA.

, Examining potentially incomplete pathways - Two pathways, physical contact with and ingestion of chemicals directly on the ordnance debris, were considered to be incomp!ete by the Army. Therefore, they were not examined in the risk assessment. The Army considered these pathways incomplete because both the future worker and recreational visitor identified for the Study Area are employees of LSAAP. Employees of LSAAP are educated in the potential health and safety risks associated with contact with explosive ordnance debris and would not touch or ingest ordnance debris. The EPA and TNRCC consider this pathway to be complete. However, because the selected remedial action removes exposed ordnance debris and institutes erosion control, this remedy is considered by EPA and TNRCC to be a best management practice against direct contact with ordnance debris.

, Using provisional toxicity values for chemicals detected in the Study Area Toxicity values of chemicals which have been officially accepted by the EPA were used for most chemicals to estimate risk in the ODA risk assessment. However for 2-amino-4,6-dinitrotoluene, 4-amino-2,6-dinitrotoluene, and nitroglycerine no officially verified toxicity values existed. Therefore, to conduct risk assessment calculations for these chemicals, EPA provided provisional toxicity values - values which have not been evaluated and formally accepted by the EPA. The toxicity values for chemicals with provisional toxicity values are highly uncertain. High uncertainty indicates that the toxicity value might change if additional toxicity data become available. These provisional values were used to develop potential cancer risk estimates for the most potentially exposed receptor, a hypothetical worker, exposed to various media at the ODA.

, Absence of toxicity values for lead - Lead does not have a slope factor or an RfD, so potential risks associated with lead exposure to adults are not included in the risk assessment. However, EPA has developed a method for evaluating lead exposure in children, the sensitive subpopulation. A soil concentration of approximately 400 mg/kg lead is required for a child to be potentially at risk from lead exposure. The average soil lead concentration for the Study Area is 20.5 mg/kg. Therefore, there is no potential risk associated with lead in soil to adult receptors.

, Adding chemicals detected only in the Phase III RI - Potential excess risks may be overestimated by adding sample results from Phase III that could not be confirmed in Phase IV. Including tetryl and 2,4,6-trinitrotoluene in the risk assessment probably overestimated risk. The impact to total potential excess risk is small.

, Contamination from laboratory chemicals - Bis(2-ethylhexyl)phthalate, which contributed to the overall cancer risk to a future worker, is a common laboratory contaminant. It is possible that Bis(2-ethyl hexyl) phthal ate was introduced to samples collected from the ODA when laboratory analysis was conducted. However, this could not be proved.

7.1.6 Conclusions of the HHRA

Future industrial workers and occasional recreational visitors who work at LSAAP are the most appropriate receptors for the HHRA. No chemicals with toxicity values in the IRIS or HEAST have a significant impact on human health. Nitroglycerine, a chemical with a provisional toxicity value, increases the total potential risk to future industrial workers to greater than 1 In 10,000.

7.2 ENVIRONMENTAL RISKS

This section summarizes the ERA which evaluated ecological risks that might be associated with chemicals released to the ODA from source material. The purpose of the ERA process is to:

, Document whether actual or potential ecological risk exists at the site
, Identify which chemicals present at the site pose an ecological risk
, Generate data to be used in evaluating clean-up actions/alternatives

The ERA process consists of the following seven steps where risk assessors provide information to risk managers and risk management decisions are required.

1. Screening-level problem formulation and ecological effects evaluation
2. Screening-level preliminary exposure estimate and risk calculation
3. Problem formulation
4. Study design
5. Verification of field sampling approach
6. Site investigation and analysis of exposure and effects
7. Risk characterization

The screening-level problem formulation, ecological effects evaluation, exposure estimate, and risk calculation (Steps one and two) identified uncertainties associated with detection limits for some chemicals sampled in the Phase I, II, and III Rls, and found that the maximum detected concentrations of other chemicals exceeded toxicity threshold values for plants, a small mammal, a carnivore, a bird, and aquatic species by using a food web model.

Therefore, the U.S. Army Biological Technical Assistance Group and EPA made several risk management decisions relating to terrestrial habitat and potential contaminant transport to East Fork Elliott Creek. These decisions were that the preliminary risks found in the screening-level exposure estimate associated with exposure to soil did not warrant terrestrial toxicity testing, and that toxicity testing would be used in lieu of further chemical analyses of sediment and surface water to evaluate potential contaminant transport to East Fork Elliott Creek. Fresh water midges (*Chironomus species*) were used as the test species for the sediment and surface water toxicity tests.

The food web model used in Steps one and two was refined by using mean soil concentrations, refined uptake/absorption, bioaccumulation, home range/site use, and mechanisms of toxicity. By using the 95 percent UCL of the mean soil concentrations and home range/site use, the model demonstrated that the potential adverse effects from chemicals resent in the Study Area were no greater than potential adverse effects from background concentrations of chemicals in the surrounding area for small mammals, carnivores, and birds.

The results of the toxicity tests demonstrated that sediment and surface water from overland flow from the ODA are similar to the sediment and surface water f rom overland f low in the reference area and therefore, do not adversely impact East Fork Elliott Creek. Additionally, no critical habitats or endangered species are affected by site contamination.

Although EPA and TNRCC consid6r the results of the ERA plausible, they have commented that the ERA conclusions left some uncertainty. The ERA compared risks from chemicals in the area to risks from areas unaffected by the ODA. EPA and TNRCC believe that only risks from the ODA should be considered and that uncertainties exist when risks are compared between a study site and an unaffected area. However, the EPA and TNRCC agree that the selected remedial action will address the uncertainties identified in the ERA.

8.0 REMEDIATION OBJECTIVES

To address the concern regarding qualitative risk to exposed source material (ordnance debris), the following Remedial Action Objectives (RAOs) were developed for the source material medium:

- Prevent dermal absorption and incidental ingestion exposure to source material
- Control soil erosion within the ODA fenced area
- Minimize infiltration and resulting leaching of source material chemicals to groundwater

RAOs have not been developed for the groundwater medium at the ODA because the potential carcinogenic risk related to nitroglycerine, the only COC in groundwater, is within EPA's acceptable risk management range. Because the selected remedy calls for waste to be left in place, the Army will utilize institutional controls to prevent use of contaminated groundwater, as required in the State's Risk Reduction Standard Number 3, 30 TAC Chapter 335 Subchapter S.

9.0 DESCRIPTION OF ALTERNATIVES

Presumptive remedies are preferred technologies for common categories of sites, based on historical patterns of selecting remedies and EPA's scientific and engineering evaluation of performance data on implementing the technology. Based on this evaluation, EPA has determined that a particular remedy, or set of remedies, is presumptively the most appropriate for addressing specific types of sites. This allows for conducting a more focused study during the FS, thereby streamlining the FS process. After completion of the Phase IV RI, the EPA, TNRCC, and the Army agreed that the ODA site characteristics, which include land disposal and unique safety, risk and toxicity characteristics, were compatible with the presumptive remedy of containment identified for military landfills containing high-hazard military-specific wastes.

The following site-specific conditions at the ODA support using the presumptive remedy approach.

- The ODA is the final disposal location for high-hazard military-specific wastes (ordnance debris) which pose a relatively low-level health or ecological threat due to their location, volume, and concentration relative to environmental receptors.

- There is no public access to the ODA and it will not be used for residential purposes in the foreseeable future.

- No chemicals with approved EPA toxicity values were identified to have a significant impact on human health.

- Chemicals present at the ODA were not identified to adversely impact small mammals, carnivores, and birds.

- Surface water and sediment from the site do not adversely impact nearby East Fork Elliott Creek.

- Excavation and disposal of the source material would require the removal of large volumes of soil and result in extreme safety hazards, which include the potential presence of unexploded ordnance.

- Except for the disposal of detonated ordnance from 1943-1944, no other types of disposal practices have occurred at the ODA.

The streamlined presumptive remedy approach allowed the analysis of alternatives to be limited to two alternatives: Alternative 1, No Action, and Alternative 2, Soil Cover, Erosion Controls, and Monitoring Controls. The No Action and Soil Cover, Erosion Controls, and Monitoong Controls alternatives were presented for public comment in the Proposed Plan. There was no request from the public to consider other alternatives. This section describes the two alternatives and how each alternative addresses the contamination at the ODA from the beginning of the remedy to the completion of site activities, the Applicable or Relevant and Appropriate Requirements (ARARs), and compliance goals of each alternative in the following sections:

- Alternative 1 - No Action
- Alternative 2 - Soil Cover, Eros,io,n C , ontrols, and Monitoring Controls

Presumptive Remedy for CERCLA Municipal Landfill Sites, OSWER Directive 9355.3-11 FS as well as EPA's interim guidance Application of CERCLA Municipal Landfill Presumptive Remedy to Military Landfills, OSWER Directive 9355.0-62FS were the basis for the FFS and the development of the alternatives.

9.1 ALTERNATIVE 1 - NO ACTION

The no action alternative is required under CERCLA and is used as a baseline against which other alternatives are evaluated. Under this alternatwe, no remediation will be conducted at the ODA; thus, there are no compliance goals for this alternative, and therefore, ARARs are not required to be addressed. However, current institutional controls will be maintained, including:

- Limited access to LSAAP
- Existing fence surrounding the ODA
- Posted warning signs on the ODA fence line

The various costs associated with selecting the no action alternative are as follow:

Capital Costs	$0
Annual Operations & Maintenance Cost	$0
30-Year Present Worth	$0
Time to Implement	Immediate

9.2 ALTERNATIVE 2 - SOIL COVER, EROSION CONTROLS, AND MONITORING CONTROLS

This section describes Alternative 2 and presents the engineering controls, institutional controls and monitoring controls as well as the ARARs associated with the remedial alternative. In addition, compliance goals are discussed.

Generally, the components of the containment presumptive remedy for CERCLA municipal landfills include:

- A landfill cap (soil cover)
- Leachate collection and treatment
- Source area groundwater control to contain plume
- Landfill gas collection and treatment
- Institutional controls to supplement engineering controls

Of these five containment presumptive remedy components, only the soil cover and institutional controls are applicable for addressing the source material RAOs for the ODA. Leachate collection and treatment is not required because leaching of chemicals from the source material does not produce a highly concentrated leachate which requires collection and treatment. Source area groundwater control to contain a plume is not required because chemicals leached from the source material do not form definable chemical plumes in the groundwater beneath the ODA. Landfill gas collection and treatment is not required because landfill gas does not, nor is expected to, result from the ODA due to the nature of the source material, which does not degrade into gas.

9.2.1 Engineering Controls

Engineering controls for Alternative 2 include the following activities:

- Removing exposed ordnance debris within the existing fenced area by explosive ordnance specialists
- Regrading and leveling the ODA as needed
- Placing a soil cover over the area consisting of 18 inches of clayey soil, classification SC or CL as defined in the "Unified Soils Classification System," and 6 inches of top soil
- Constructing erosion control berms along the northern and eastern boundaries of the ODA and within the ODA's interior to prevent erosion of the soil cover
- Revegetating the soil cover and berms
- Posting new warning signs along a single strand cable to mark the ODA boundaries

9.2.2 Institutional Controls

Institutional controls for Alternative 2 include the following activities:

- Restricting future land use of the ODA using the deed recordation procedures identified in TAC Chapter 335 Subchapter S Subsection 335.566
- Preventing future ingestion of groundwater within the Study Area by the Army controlling groundwater well permits

9.2.3 Monitoring Controls

Monitoring controls for Alternative 2 performed by LSAAP personnel include the following activities:

- Conducting periodic inspections of the soil cover, berms, and cable that marks the ODA boundaries to identify if maintenance is required
- Performing preventative maintenance and repairs
- Installing additional monitoring wells as determined during the remedy design phase
- Performing quarterly groundwater and surface water monitoring for 3 years to determine if contamination is moving off of the ODA at increased concentrations
- Performing annual groundwater and surface water monitoring after the third year

- , Evaluating the effectiveness of this remedial action every 5 years by analyzing data collected over the previous 5-year period and writing a report summarizing this evaluation

Selection of existing wells to be monitored and the siting of any new monitoring wells will be presented in the Remedial Design for the ODA. EPA and TNRCC will concur with the Remedial Design before implementing the selected remedy.

The various costs associated with selecting the preferred alternatives are as follow:

Capital Cost	$968,000
Annual Operations & Maintenance Cost	$99,300
Net Present Value (based on 30 years)	$1,664,650
Time to Implement	6 months

9.2.4 Applicable or Relevant Ago Appropriate Requirements

This section presents the location-specific and action-specific ARARs associated with the Alternative 2, Soil Cover, Erosion Controls, and Monitoring Controls and lists these in Table 9-1 and 9-2. There are no chemical-specific ARARs. The explanation of these ARARs follows.

The Study Area is nesting habitat for migratory birds making the Migratory Bird Treaty Act a location-specific ARAR. Therefore, the remedial action should be coordinated with local wildlife agencies so that activities do not take place during nesting season if migratory birds are present. If remedial activities uncover previously undiscovered historical or archeological resources, the Archeological and Historic Preservation Act becomes a location-specific ARAR. Remedial activities should cease until the historical or archeological data can be recorded in accordance with the Archeological and Historic Preservation Act. References to hazardous waste storage facility siting requirements are not included in Table 9-1 because any waste material removed from the Study Area will be stored in an existing 90-day storage area or an interim status permitted area; therefore, siting requirements are not location-specific ARARs.

The surficially exposed source material removed from the ODA will be considered RCRA hazardous waste. The source material will be transported to the High Explosives Demolition Ground, a RCRA interim status facility, for destruction by detonation. Therefore, hazardous waste identification requirements, generator requirements, and land disposal restriction requirements win be met. Since TNRCC has authority over the RCRA program and since receipt of that authority requires that state hazardous waste regulations be as stringent or more stringent than the Federal regulations, only state hazardous waste regulations are listed in Table 9-2.

Clearing the land, construction, and excavation generate dust. There are several regulations that require the suppression of dust or particulate matter. These regulations include the National Ambient Air Quality Standards codified in 40 Code of Federal Regulations (CFR) 50, and state Construction and Demolition Standards and Nuisance Standards codified in 30 TAC 111.145 and 30 TAC 101.4, respectively. These requirements will be met by wetting the area with water or an appropriate chemical prior to conducting dust generating activities.

Table 9-1. Location-Specific Applicable or Relevant and Appropriate Requirements for Alternative 2 - Soil Cover, Erosion Controls, and Monitoring Controls.

Requirement	Relevance to the ODA
FEDERAL LAWS AND REGULATIONS	
<u>Migratory Bird Treaty Act</u> Protects migratory, resident. Or range habitat of migratory birds including raptors and waterfowl (16 USC 703 <u>et. seq.</u>)	The Study Area is habitat for migratory birds or raptors. Therefore, remedial actions cannot threaten or adversely affect the habitats of these birds. Coordination with Federal and state agencies is required.
<u>The Archeological and Historic Preservation Act</u> Establishes procedures to provide for preservation of historical and archeological data which might be destroyed through alteration of terrain as a result of a Federal construction project or a Federally licensed activity program (16 USC 496, 40 CFR 6.301(c))	This requirement is applicable if remedial activities uncover previously undiscovered historical or archeological resources in the Study Area. Data must be recorded before remedial activities can continue.

CFR Code of Federal Regulations
USC United States Code

Table 9-2. Action-Specific Applicable or Relevant and Appropriate Requirements for Alternative 2 - Soil Cover, Erosion Controls, and Monitoring Controls.

Requirement	Relevance to the ODA
FEDERAL LAWS AND REGULATIONS	
National Ambient Air Quality Standards (Particulates) Regulates nonpoint source contributions to fugitives dust. The annual geometric mean cannot exceed 75 micrograms per cubic meter and a maximum 24-hour concentration of 260 micrograms per cubic meter cannot be exceeded more than once per year (40 CFR 50.6).	Dust generating activities must employ dust suppression to minimize generation of airborne particulates.
Occupational Safety and Health Administration Regulations Provides requirements for the protection of worker health and safety during remedial activities (29 CFR 1910, 1926).	Workers participating in remedial activities involving hazardous materials are protected by the requirements in 29 CFR 1910. Workers participating in construction activities are protected by standards in 29 CFR 1926. All remedial activities must be conducted in accordance with these regulations.
TEXAS LAWS AND REGULATIONS	
Requirements for Specified Sources Visible emissions shall not be permitted to exceed an opacity of 30 percent for any six-minute period. Applies during any activity that may generate visible emissions (30 TAC 111.111).	These requirements are relevant and appropriate to construction activities that generate visible dust.
Construction and Demolition Requires use of water or suitable oil or chemicals for control of dust in construction operations or clearing of land. Applicable to projects more than 1 acre in size (30 TAC 111.145).	The ODA is much greater than 1 acre; dust suppression must be employed during land clearing, excavation, capping, and grading activities.
Nuisance Prohibits the discharge of air contaminants from any source in such concentrations or of such duration as may adversely affect human health or welfare, animal life, vegetation, or property or as to interfere with the normal enjoyment of property (30 TAC 101.4).	Emissions of particulate matter from remediation activities must be suppressed.
Hazardous Waste Management General Provisions (Subchapter B) Implements a hazardous waste program which controls from point of generation to ultimate disposal waste listed in 40 CFR 261 (30 TAC 335.41).	Provisions of this subchapter are applicable to source material classified as RCRA hazardous waste.

Table 9-2. Action-Specific Applicable or Relevant and Appropriate Requirements for Alternative 2 - Soil Cover, Erosion Controls, and Monitoring Controls.

Requirement	Relevance to the ODA
Standards Applicable to Generation of Hazardous Waste (Subchapter C) Establishes standards for generators of hazardous waste including packages, labeling, marking, placarding, accumulations time, and record keeping (30TAC 335.61; 335.65-70).	If surficially exposed source material removed from the ODA is classified as RCRA hazardous waste and is stored in containers for a period less than 90 days, the substantive requirements of this subchapter are applicable.
Interim Standards for Owners and Operating of Hazardous Waste Storage, Processing, or Disposal Facilities (Subchapter E) Established minimum requirements that define the acceptable management of hazardous waste prior to the issuance or denial of a hazardous waste permit (30 TAC 335.111-335.123).	If surficially exposed source material removed from the ODA is classified as RCRA hazardous waste and is stored, treated, or disposed in the on-site High Explosives Demolition Ground, the substantive requirements of this subchapter are applicable until such time as a permit issued by TNRCC for the High Exposure Demolition Ground.
Interim Standards for Owners and Operators of Hazardous Waste Storage, Processing. Or Disposal Facilities (Subchapter F) Establishes minimum standards to define the acceptable management of hazardous waste (30 TAC 335.151-335.183).	If surficially exposed source material removed from the ODA is classified as RCRA hazardous waste and is stored, treated, or disposed in the on-site High Explosives Demolition Ground, the substantive requirements of this subchapter are applicable after a permit issued by TNRCC for the High Exposure Demolition Ground.
Land Disposal Restriction (Subchapter O) Adopts 40 CFR 268 by reference (30 TAC 335.431).	Source material classified as RCRA hazardous waste must meet the treatment standards prior to disposal in a land based unit.
Hazardous Waste Determinations (Subchapter R) Required waste generator to determine if the waste is hazardous based on the criteria in 40 CFR 261 (30 TAC 335.504).	A waste determination must be made on surficially exposed source material removed from the ODA.
Remedial Cleanup Standards (Subchapter S) The primary state regulations addressing remedial clean-up standards for soil and groundwater require compliance with one of three possible Risk Reduction Standards (30 TAC 335.551-335.569).	Clean-up of contaminated media must be to health-based standards and criteria. Risk Reduction Standard Number 3 is relevant and appropriate. Groundwater that is current or potential source of drinking water must be remediated to maximum contaminant levels, or if approved by the State, alternate concentration limits.
Municipal Solid Waste Regulations Sets the design, operation, and closure standards for municipal solid waste landfills (30 TAC 330).	Specific subchapters in the regulations regarding access control, deed restrictions, closure, and post-closure care are relevant and appropriate to capping of the ODA. Regulations regarding operations are not applicable.

CFR Code of Federal Regulations
ODA Old Demolition Area
RCRA Resource Conservative
TAC Texas Administrative

The ODA will be capped based on the guidance in EPA's Application of the *CERCLA Municipal Landfill Presumptive Remedy to Military Landfills.* The presumptive remedy as defined in the EPA guidance contains five components. However, only two components are applicable to the ODA and are used as part of the presumptive remedy for the ODA, including the landfill cap and institutional controls to supplement engineering controls.

The state municipal solid waste regulations are codified in 30 TAC 330 and many of the requirements are considered relevant and appropriate to capping the ODA. The landfill cap for the ODA will consist of a 24-inch clayey soil cover and meets these relevant and appropriate requirements. Engineered groundwater controls are not required at the ODA. However, groundwater will continue to be monitored as part of the post-closure care requirements in 30 TAC 330. Other post-closure activities included in the presumptive remedy alternative are surface water monitoring, use of institutional controls (such as posting signs and groundwater and land use restrictions), periodic inspections, and 5-year reviews. Workers' safety requirements are always ARARs for remedial activities. The construction workers safety regulatior,s in 29 CFR 1926 and the regulations for workers exposed to hazardous substances in 29 CFF 1910.120 will be met.

Risk keduction Standard Number 3 in 30 TAC Chapter 335 Subchapter A ana S is an ARAR for the remedial actions at the ODA. The risk-related requirements in this standard will be met.

9.2.5 <u>Compliance Goals</u>

Additional site-specific criteria beyond the required NCP criteria have been developed for evaluating alternatives atthe ODA. Compliance goals have been established to evaluate the effectiveness of the soil cover in conjunction with erosion control berms at the ODA to minimize infiltration of precipitation and resulting leaching of source material chemicals to groundwater. These compliance goals are separate and distinct from the NCP requirement that a five year review be conducted to evaluate whether the response action remains protective of public health, welfare, or the environment. To evaluate the effectiveness of the soil cover, compliance goals for evaluating the surface water and groundwater will be compared to the monitoring data. The Army will initially sample water from two surface water locations and sample an appropriate number of down gradient monitoring wells (established as part of the groundwater monitoring program during the remedy design phase) quarterly to monitor surface water and groundwater for explosives.

The following compliance goals for comparison to explosive concentrations in the groundwater and surface water monitoring samples have been developed. These compliance goals have been developed based on human health and aquatic life risk-based criteria.

Compliance goals for human health criteria:

, If groundwater and/or surface water explosives are detected at or below the maximum concentration detected historically for that explosive, the Army will monitor quarterly for 3 years and annually for an additional 2 years.

, If groundwater and/or surface water explosives are detected above the maximum concentration detected historically for that explosive, the Army will conduct quarterly monitoring for that explosive until the concentration returns to the historical maximum concentration or the concentration of explosives exceeds the 1 in 1,000 risk-based concentration.

- If groundwater and/or surface water explosives are detected above the risk-based concentration of 1 in 1,000 for two consecutive sampling events, the Army will reevaluate the effectiveness of the remedy.

Compliance goals for aquatic life criteria:

- If surface water explosives are detected above the maximum concentration detected historically for that explosive, the Army will conduct quarterly monitoring for that explosive until the concentration returns to the historical maximum concentration or until the concentration of explosives exceeds the risk-based concentration for aquatic life.

- If surface water explosives are detected above the risk-based concentration for aquatic life for two consecutive sampling events, the Army will re-evaluate the effectiveness of the remedy.

Table 9-3 presents the explosives historically detected at the ODA, the maximum concentration df cected, and the 1 in 1,000, the 1 in 1,000,000 risk-based concentration, for human health, and the risk-based concentration for aquatic life. Risk-based concentrations are estimated, assuming an Industrial worker drinks 1 liter of water a day, 200 days a year for 20 years. The risk-based concentrations for aquatic life were provided by TNRCC.

10.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

To select the remedy, the No Action Alternative (Alternative 1), and Alternative 2 were evaluated using the following EPA remedial action evaluation criteria:

- Protection of Human Health and the Environment
- Compliance with ARARs
- Long-Term Effectiveness and Permanence
- Reduction of Toxicity, Mobility, or Volume Through Treatment
- Short-Term Effectiveness
- Implementability
- Cost
- State Acceptance
- Community Acceptance

Table 10-1 evaluates which alternative provides the best balance of tradeoff s with respect to these evaluation criteria.

11.0 SELECTED REMEDY

This section describes the selected remedy in detail as follows:

- Provides the RAOs to be attained at the conclusion of implementing the selected remedy and point of compliance for the media being addressed

- Provides the Army's basis for the RAOs

Table 9-3. Risk-Based Concentrations for Explosives Historically Detected at the Old Demolition Area.

Explosive	Maximum Concentration Detected (µg/L)	1 in 1,000 Risk-Based Concentration for Human Health (µg/L)	1 in 1,000,000 Risk-Based Concentration for Human Health (µg/L)	Risk-Based Concentration for Aquatic Life (µg/L)
1,3,5-Trinitrobenzene	0.25	SFNA	SFNA	ACNA
1,3-Dinitrobenzene	0.21	SFNA	SFNA	354
2,4-Dinitrotoluene	2.78	658	0.7	ACNA
2,4,6-Trinitrotoluene	9.27	14,900	15	404
2-Amino-4,6-dinitrotoluene	3.72	SFNA	SFNA	3740
4-Amino-2,6-dinitrotoluene	1.65	SFNA	SFNA	ACNA
HMX	2.74	SFNA	SFNA	3790
Nitroglycerine	108	213	0.2	345
Nitrobenzene	0.81	SFNA	SFNA	ACNA
Pentaerythritol tetranitrate	323	SFNA	SFNA	2,147,890
RDX	4.74	4,065	4.1	910
Tetryl	8.22	SFNA	SFNA	ACNA

Risk-based concentrations for human health assume an industrial worker drinks 1 liter of water a day, 200 days a year for 20 years.

Risk-based concentrations for aquatic rife were provided by the Texas Natural Resource Conservation Commission,

ACNA Aquatic Risk-Based Concentration Not Available
SFNA Oral Slope Factor Not Available
µg/L micrograms per liter

Table 10-1. Summary of the Alternatives Evaluation for the Old Demolition Area.

Evaluation Criteria	Alternative 1 - No Action	Alternative 2 - Presumptive Remedy, Soil Cover, Erosion Controls, and Monitoring Controls
PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT		
Human Health Protection	Allows for continued potential exposure to surficially exposed source material and leaching of source material chemicals to groundwater. Provides no significant reduction in risk. Provides some reduction in access to risk through use of a fence.	Soil cover eliminates the potential risk related to dermal adsorption and incidental ingestion exposure to source material. Institutional controls provide protection against the potential risk related to ingestion of groundwater.
Environment Protection	Allows continued leaching of source material chemicals to groundwater.	Soil cover controls erosion and minimizes infiltration of precipitation and resulting leaching of source material chemicals to groundwater.
COMPLIANCE WITH ARARS		
Chemical-Specific ARARs	No Chemical-specific ARARs available.	No chemical-specific ARARs available.
Location-Specific ARARs	ARARs are not required to be addressed.	In compliance with location-specific ARARs.
Action-Specific ARARs	ARARs are not required to be addressed.	The 24-inch clayey soil cover meets the thickness requirements and should provide adequate erosion control and minimize infiltration of precipitation.
Other Criteria and Guidance	None	None
LONG-TERM EFFECTIVE AND PERMANENCE		
Magnitude of Residual	Source has not been removed. Eventually natural attenuation and dilution may decrease the potential risk for ingestion of groundwater.	Risk related to source material exposure is eliminated as long as the soil cover is maintained, because source material is contained but still remains in place. Institutional controls are used to restrict future use of groundwater. However, future unauthorized use of groundwater could result in exposure.
Adequacy and Reliability	No controls. No reliability.	Soil cover controls source material. Reliability of soil cover can be high if maintained. Risk to ingestion of groundwater is controlled by institutional controls.
Need for 5-Year Review	Not applicable since no monitoring.	Review would be required to ensure that adequate protection of human health and the environment is maintained.
REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT		
Treatment Process Used	None	The selected remedy is a containment remedy, however; a small quantity of the total source material (that has become surficially expose over time due to soil erosion at the ODA) will be cleared to facilitate the safe placement of the erosion control and soil cover components of the remedy. This material will be removed by hand by appropriately trained explosive ordnance specialists. The source material will be transported to the High Explosives Demolition Ground at LSAAP for destruction by detonation.

Evaluation Criteria	Alternative 1 - No Action	Alternative 2 - Presumptive Remedy, Soil Cover, Erosion Controls, and Monitoring Controls
Amount Destroyed or Treated	None	Surficially exposed ordnance debris will be transported to the High Explosive Demolition Ground at LSAAP for destruction by detonation. The amount to be destroyed is difficult to estimate as it will be picked by hand at the time of the remedial estimate. However, this represents only a small quantity of the total source material embedded in the ODA subsurface soil.
Reduction of Toxicity, Mobility, or Volume	None	Reduction by treatment methods is not applicable. However, soil cover minimizes infiltration of precipitation and resulting leaching of source material chemicals, thereby reducing mobility of these chemicals.
Irreversible Treatment	Not Applicable	Not Applicable
Type and Quantity of Residuals Remaining After Treatment	Not Applicable	Not Applicable
Statutory Preference for Treatment	Does not satisfy statutory preference.	Does not satisfy statutory preference.
SHORT-TERM EFFECTIVENESS		
Community Protection	Risk to communities surrounding LSAAP does not increase by this alternative.	Risk to communities surrounding LSAAP does not increase by this alternative.
Worker Protection	Continued impact from existing conditions.	Temporarily increases fugitive dust due to site preparation and soil cover construction. Requires suppression of fugitive dust during these activities. Requires protection against potential UXO-related safety hazards during site preparation and soil cover construction.
Environmental Impacts	Continued impact from existing conditions.	Some migration of source material chemicals in groundwater would occur as part of the natural attenuation process.
Time Until Action is Complete	Not Application	Soil cover installed in 6 months. Potential risk from potential exposure to groundwater, abated upon implementing institutional controls.
IMPLEMENTABILITY		
Ability to Construct and Operate	Not Application	Simple to operate and construct. Would require materials handling of about 60,000 cubic yards of clayey soil for the soil cover and an undetermined amount of fill material.
Ease of Doing More Action if Needed	Proposes no monitoring.	Not Applicable
Ability to Monitor Effectiveness		Proposed groundwater and surface water monitoring will identify effectiveness of soil cover.

Evaluation Criteria	Alternative 1 - No Action	Alternative 2 - Presumptive Remedy, Soil Cover, Erosion Controls, and Monitoring Controls
Ability to Obtain Approvals and Coordinate with other Agencies	Regulatory approval of this alternative is unlikely.	Requires notification of the state concerning soil disturbance of an area greater than 5 acre and prior to burning vegetative debris. Approvals for these activities should be easy to obtain.
Availability of Services and Capacities	Requires no services or capacities.	Requires no services or capacities.
Availability of Equipment, Specialists, and Materials	None required.	No special equipment or material are required. Explosive ordnance specialists are available at LSAAP. Soil cover material is available in areas adjacent to ODA.
Availability of Technologies	None required.	Soil cover/cap technology is readily available.
COST		
Capital Cost	$0	$968,000
Annual Operation & Maintenance Cost	$0	$99,300
Net Present Value	$0	$1,664,650
STATE ACCEPTANCE		
Features of the Alternative the State Supports	None.	Implementation of engineering, institutional, and monitoring controls.
Features of the Alternative About which the State Has Reservations	Does not meet TNRCC guidance on closure of land-based nonhazardous waste management units.	None.
Elements of the Alternative the State Strongly Opposes	Does not meet TNRCC guidance on closure of land-based nonhazardous waste management units.	None.
COMMUNITY ACCEPTANCE		
Features of the Alternative the Community Supports	The community had no comment in this alternative.	The community had no comment on the features of this alternative.
Features of the Alternative About which the Community Has Reservations	The community had no comment in this alternative.	The community had no objections to this alternative.
Elements of the Alternative the Community Strongly Supports	The community had no comment in this alternative.	The community had no objections to this alternative.

ARAR Applicable or Relevant and Appropriate Requirement
LSAAP Lone Star Army Administrative Plant
ODA Old Demolition Area
TNRCC Texas Natural Resource Conservation Commission
UXO Unexploded Ordinance

- Identifies and summarizes the engineering and institutional controls that will be part of the remedy

- Provides estimated costs of the remedial action

- Provides annual operating and maintenance cost

The selected remedy provides the best balance of tradeoffs over no action with respect to the remedial action evaluation criteria. To facilitate developing a range of RAOs to protect human health and the environment, numeric preliminary remediation goals are usually developed. However, because the presumptive remedy's focus is on containment, not clean-up, numeric preliminary remediation goals have not been developed for the COCs at the ODA.

The Phase IV ERA concluded that chemicals present in the Study Area do not adversely impact the environment. Therefore, only RAOs for protecting human health have been developed for the ODA. However, the measures included in the presumptive remedy alternative are designed to adequately address any potential uncertainty in the overall site risk for both the HHRA and the ERA. RAOs were developed based on conclusions drawn from the Phase IV HHRA and the ERA and EPA's concern regarding uncertainty related to a nonquantifiable risk associated with surficial exposure of ordnance debris. The following information was used to develop RAOs for the ODA.

- COCs - Source material and groundwater are the two media of concern at the ODA. The COCs for the source material medium are tetryl and 2,4,6- trinitrotoluene based on potential risk associated with direct contact with the surficially exposed source material. Groundwater is considered a media of concern for the ODA because the total risk for a future industrial worker through ingestion of chemicals in groundwater is 1.1 in 10,000, which is above EPA's acceptable risk management range and not in compliance with the standards of Risk Reduction Standard Number 3 in 30 TAC Chapter 335 Subchapter A and S. The COC in groundwater is nitroglycerine.

- ARARs - Chemical-specific, location-specific, and action-specific ARARs were used to develop RAOs. Currently, there are no chemical-specific ARARs for the COCs. Location-specific ARARs applicable at the ODA include the Migratory Bird Treaty Act and the Archeological and Historic Preservation Act. Action-specific ARARs are summarized in Section 9.0 of this Decision Summary.

The RAOs developed for the source material include preventing future exposure to source materials, minimizing infiltration and resulting leaching of source material chemicals to groundwater, and controlling soil erosion within the existing ODA fenced area. The RAOs for the source material medium at the ODA will be addressed by implementing the selected remedy which includes containment actions, institutional controls, and monitoring activities. Specifically, the RAOs will be accomplished by:

- Clearing surficially exposed source material

- Regrading, leveling, and placing a soil cover over the ODA

- Constructing erosion control berms along the northern and eastern ODA perimeters and within the fenced area

, Revegetating the soil cover and berms

A description of the specific components of the selected remedy follows.

Site preparation work will include clearing vegetation from the ODA fenced area and a borrow area located to the north of the ODA. Top soil and fill material will be obtained from this borrow area. The existing ODA fence will be removed and related debris will be disposed in the installation's sanitary landfill. The area which was enclosed by this fence is referred to hereafter as the former fenced area. The former fenced area and borrow area will be cleared of existing vegetation. Timber will be salvaged if possible from the borrow area. Vegetative debris will be disposed by burning in both areas. The residual vegetative debris will be buried. The state will be notified as appropriate to obtain the necessary approvals related to soil disturbance of an area greater than 5 acres and burning vegetative debris.

Source material that is surficially exposed in the former fenced area will be removed by hand by appropriately trained explosive ordnance specialists. This represents only a small quantity of the total source material (that has been surficially exposed over time due to soil erosion at the ODA). This will facilitate the safe placement of the erosion control and soil cover components of the remedy. Source material that is removed will be stored in appropriate shipping containers at an existing 90-day storage area or an interim status or permitted RCRA storage area. The source material will be transported to the High Explosives Demolition Ground at LSAAP for destruction by detonation. The High Explosives Demolition Ground is an interim status RCRA treatment facility.

The former fenced area be regraded and leveled as needed. Fill material and top soil will be obtained from the borrow area. Therefore, material hauling will be minimized. Bidirectional "S" type soil berms will be constructed within the former fenced area and along the northern and eastern former fenced boundaries. A 24-inch soil cover will be placed over the former fenced area. The soil cover material will consist of a clayey soil. It is anticipated that about 60,000 cubic yards of clayey soil will be required for the soil cover in addition to an undetermined amount of fill material. Dust suppression methods will be employed during site preparation and soil cover construction to control fugitive dust that may be generated by these activities. Silt fences, hay bales, or other erosion control techniques will be used during these activities to minimize soil migration.

The soil cover, berms, and the borrow area will be revegetated. A cable barrier fence will be constructed along the former fence line using a single strand of cable to delineate the location of the soil cover. New warning signs will be posted along the new fence line at the ODA.

Future land use for the ODA will be restricted by using deed recordation procedures. The Army will follow the deed recordation procedures identified in 30 TAC 335.566. Future ingestion of groundwater within the Study Area will be prevented by restricting groundwater well permits. The Army will restrict the potential installation of production water wells in this area through the use of a well permitting program implemented by LSAAP environmental personnel. Through such an on-site permitting program, the Army will be able to control and thereby restrict the drilling of wells in designated areas such as the ODA.

Installation personnel will conduct periodic inspections of the soil cover, berms, and fence to identify any needed maintenance to these components. Preventative maintenance and any necessary repairs will be performed by the installation personnel as needed.

The Army will install additional monitoring wells, and installation personnel will perform quarterly groundwater monitoring for the first three years, and annual groundwater monitoring thereafter, as long as Compliance Goals continue to be met. Installation personnel will also collect surface water samples from two locations quarterly for the first three years, and annually thereafter, as long as Compliance Goals continue to be met. The surface water samples will be collected from the seep area located south of the ODA and north of the south drainage; and from the south drainage, downgradient from the confluence with the east drainage. The groundwater and surface water samples will be sent to an off-post laboratory for explosives analysis. The analytical results will be reviewed and maintained by installation personnel.

The net present value to implement the selected remedy is approximately $1,664,650. Capital costs are approximately $968,000 and the annual operation and maintenance costs are approximately $99,300.

The effectiveness of this remedial action will be evaluated every 5 years. Data collected during the five previous annual sampling events will be compiled and a report will be written summarizing the effectiveness evaluation. Compliance goals have been developed to evaluate the surface water and groundwater monitoring data. Changes may be made to the remedy as a result of the remedial design and construction processes which reflect modifications resulting from the engineering design process.

12.0 STATUTORY DETERMINATIONS

This section describes how the selected remedy meets the following statutory requirements of CERCLA:

- Be protective of human health and the environment
- Comply with ARARs
- Be cost-effective
- Utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent possible
- Explain why treatment was not the statutory preference because of the remedial action of containment

12.1 PROTECTION OF HUMAN HEALTH, WELFARE, OR THE ENVIRONMENT

The selected remedy protects human health, welfare, or the environment. By implementing this remedy, the uncertain risk related to dermal adsorption and incidental ingestion exposure to surficially exposed source material will be eliminated and the quantifiable total site exposure risk for the future industrial worker will be reduced.

12.2 COMPLIANCE WITH ARARs

The selected remedy will comply with all ARARs identified in Tables 9-1 and 9-2 in this ROD. No waiver of ARARs is expected to be necessary.

12.3 COST EFFECTIVENESS

The Army has determined that the selected remedy is cost effective in mitigating the principal risks posed by the source material. Section 300.430(f)(ii)(D) of the NCP requires evaluation of cost effectiveness. Overall effectiveness is determined by balancing the three following criteria: Longterm effectiveness and permanence; reduction of toxicity, mobility, and volume through treatment; and short-term effectiveness. Overall effectiveness is then compared to cost to ensure that the remedy is cost effective. The selected remedy of containment meets the criteria, although treatment does not occur, and provides for overall effectiveness in proportion to costs. The estimated cost for the selected remedy is $1,664,650. The cost estimate includes periodic inspection and operation and maintenance.

12.4 UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES TO THE MAXIMUM EXTENT POSSIBLE

The selected remedy does not utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent possible because treatment would require removal of large volumes of soil and present potential high safety hazards. The EPA has established that a proper cover has proven effective in containing hazards presented by such landfills. The ODA meets the criteria of a military landfill, because of the presence of high-hazard military-specific wastes, and lends itself to the presumptive remedy's preference for containment. The Army has determined that the selected remedy for the ODA provides the best balance in terms of long-term effectiveness and permanence, implementability, cost, and state and community acceptance.

While the selected remedy for the ODA does not utilize the more permanent solution of treatment or removal, the use of an engineered soil cover provides a long-term effective barrier to the source material, thus reducing risk. Because the source material will remain on site with no treatment, the selected remedy will require a 5-year review under Section 121 (c) of CERCLA and Section 300.430(f)(4)(ii) of the NCP.

12.5 PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

Treatment of the source material at the ODA, other than surficially exposed ordnance debris, is not supported based on the findings of the RI. Any risks associated with the ODA can be addressed by installing a soil cover to eliminate exposure and reduce erosion and by restricting access to the ODA.

13.0 DOCUMENTATION OF SIGNIFICANT CHANGES

The selected remedy for the ODA, the presumptive remedy of containment, is the same as the preferred alternative presented in the Proposed Plan for the ODA.

RESPONSIVENESS SUMMARY

Responsiveness Summary

The Responsiveness Summary consists of the following sections:

- Overview
- Background on Community Involvement
- Public Comments Related to the Selected Remedy for the ODA and Army Responses
- Public Comments Related to LSAAP and Army Responses

OVERVIEW

At the time of the public comment period, the Army proposed a preferred remedy for the ODA at LSAAP in Texarkana, TX. The Army's proposed preferred remedy addressed prevention of exposure to source material, soil erosion control, and minimization of infiltration and resulting leaching of source material chemicals to groundwater. The proposed remedy specified in the ROD involves the following components:

- Clearing surficially exposed source material
- Regrading, leveling, and placing a soil cover over the ODA
- Constructing erosion control berms along the northern and eastern ODA perimeters and within the site's interior
- Revegetating the soil cover and berms
- Implementing institutional controls restricting future land use
- Conducting periodic inspections of the soil cover, berms, and cable to identify any needed maintenance and performing maintenance
- Installing two additional monitoring wells
- Performing groundwater and surface water monitoring
- Evaluating the effectiveness of the selected remedy every 5 years

The comments received during the public comment period indicate that the citizens of Texarkana, TX have no objections to the proposed remedy for the ODA.

BACKGROUND ON COMMUNITY INVOLVEMENT

This section describes how the community involvement requirements in CERCLA Sections 113 and 117 were met. Throughout the RI/FS process, the Army held quarterly Technical Review Committee meetings which were open to the public for obtaining information. The RI, FFS, and Proposed Plan for the LSAAP ODA were released to the public in January 1997, March 1998, and May 1998, respectively. These documents are available to the public in the administrative record at LSAAP and information repositories maintained at the Texarkana Public Library and Maud Public Library. The Army established a public comment period from May 25, 1998 through

August 7, 1998 for interested parties to review and comment on remedial alternatives considered and described in the Proposed Plan. In addition, the Army held a public meeting on July 7, 1998 at 7:00 p.m. at the Recreation Center at LSAAP to discuss the proposed remedy to reduce risk and control potential hazards at the ODA. Public notices of the Proposed Plan and associated public meeting were placed in the Texarkana Gazette and the Citizen Tribune newpapers and run on KTOY-FM, STAR 107, KCMC, and KOWS radio stations. A written transcript of this meeting is available to the public in the administrative record and information repositories.

The Army, EPA, or TNRCC did not receive any comments on the proposed remedy other than those discussed at the public meeting. Comments provided at the meeting and the Army's responses are presented in the following sections of the Responsiveness Summary. Responses provided in the public meeting have been reviewed and edited for accuracy and thoroughness.

PUBLIC COMMENTS RELATED TO THE SELECTED REMEDY FOR THE ODA AND ARMY RESPONSES

Comments related to the proposed remedy for the ODA have been organized in the following categories: ODA Operational History, Data/Studies, Long-Term Monitoring, Land Use, and Groundwater.

ODA OPERATIONAL HISTORY

Question: *What specific chemicals are in the debris? What are some of the metals?*

Response: Tetryl, 2,4,6-trinitrotoluene, and heavy metals were detected in the ordnance debris. The casings are mainly composed of aluminum, copper, iron, lead, manganese, and zinc.

Question: *Was there any digging at the site? Is there a hole out there? What's the depth? How deep is it? Did all the dumping occur on the surface?*

Response: The ordnance that was destroyed in that area during 1943 and 1944 was 20-mm tracer ammunition that was produced at LSAAP and also some artillery and mortar fuzes. Those fuzes and the rounds were bad or off-specification ordnance. To dispose of them, a depression was dug and they were put in a pile and then an explosive was used to cause all the off-specification ordnance to detonate. The depressions were dug by a bulldozer and probably were not over 5 or 6 ft deep. The fact that the off-specification ordnance was not covered or compacted before the explosion is one of the reasons that there is explosive debris at the site now.

DATA/STUDIES

Question: *Were the metals that you mentioned, which are hazardous to human beings, below the maximum contaminant level?*

Response: Metals were below the maximum contaminant levels in groundwater. Additionally, concentrations of metals in soil were above background concentrations but below levels of health concern.

Question: *Does the Army have data available for levels found off site?*

Response: The Army has data available for off of the ODA. The Army does not have data available that is off of the plant. There is no reason for the Army to collect such data, because there has been no indication that there is any movement of chemicals in the groundwater or surface water or sediment off of the plant.

Question: *Is it the opinion of everyone here that there is no off site migration of contaminants from this site?*

Response: The Army, EPA, and TNRCC have seen no evidence that anything from the ODA has migrated to the plant's boundary.

Question: *Has there been a hydrological assessment made of the ODA, and if so, who did that?*

Response: Hydrologic studies were part of all four phases of the RI. Thus, each contractor involved with the RI conducted hydrologic studies. These firms are Dames & Moore, Fluor Daniels, and AGEISS Environmental, Inc (AGEISS). These studies concluded that the ODA and the area immediately surrounding the ODA need remediation. Thus, an FFS was conducted which resulted in a recommended remedial action.

Question: *Is the monitoring data available at the library on all the testing that was done, both on site and off site?*

Response: Monitoring data from all phases of the RI are available at the Texarkana and Maud public libraries.

LONG-TERM MONITORING

Question: *What contaminants will the Army monitor for in the future under the remediation plan? What specific organics and inorganics will be tested for in the future?*

Response: The Army will test for explosives, including nitroglycerine and trinitrotoluene, in both groundwater and surface water. The Army will not be testing for inorganics, because they have not been detected at levels that would pose a risk.

LAND USE

Question: *Do you know the merits of the residential area through this site and whether or not it is downgradient? The nearest residents live in this area, and as far as hydrology goes is it downgradient from this site?*

Response: The nearest residential area is downgradient; surface water drainage from the ODA is towards the south. The nearest residential area is located about a mile and three quarters south of LSAAP's southern boundary, about 0.8 miles southeast of Texas Farm Road 991.

Question: *Are people on water wells in the area or are they on city water?*

Response: The majority of residents in the area obtain their drinking water from the City of Texarkana Water Utilities. There are no known water wells within 2 miles of the ODA.

Question: *Will any of the land specifically near Texas Farm Road 991 be turned back over to the county in the future?*

Response: The local reuse authority was first started as a result of a request from Redwater Independent School District to RRAD for release of that 500 acres for a school. The Army was asked if a potential change in land use would have any effect on the NPL site. The Army believed that it probably would. Every study that had been done to that point had assumed that the southern boundary would not change. As a result, Army headquarters at Rock Island has decreed that land will stay with the Army until the future when the Army decides to close LSAAP completely. There is no intent to release that 500 acres. In the event that property is ever transferred to the public, there are environmental investigations that have to be conducted for any property transfer are a lot more comprehensive than this process.

GROUNDWATER

Question: *Could you clarify: (a) Of the 17.4 acres, have there been monitoring wells put in, and if so, at what depth? (b) In this process of putting in monitoring wells have any contaminants been picked up in groundwater, heavy metal or nitroglycerin that could be of concern whatsoever? (c) TNRCC, how do you know that there is not heavy metal or nitroglycerin contamination at any level? And if so, what happened? We just finished one Superfund site a few weeks ago and the thing about it was we were dealing with heavy metals, cadmium, chromium, aluminum, and not more than 25 miles south. And the gentleman has asked you point blank, do you know if it has migrated off site?*

Response: Wells have been drilled upgradient and downgradient of the ODA. The ODA was originally defined by the fenced area, 17.4 acres. But the Study Area is actually much larger than the 17.4 acres and a number of wells have been drilled outside the ODA but within the Study Area.

The metals in groundwater going away from the site are not above background levels, so the Army does not have metals above background levels outside the study area. Explosives are slightly different. Nitroglyercine is detected in groundwater from wells that are south of the south drainage of the site. So explosives have been detected in groundwater south of the ODA at concentrations that are below human health risk level.

Question: Would all the metals detected be below the safe drinking water standard?

Response: All metals detected were within background levels.

Question: *What tests were conducted to establish comparisons of background criteria? Are those wells upgradient from the site?*

Response: The well that was used as a reference well had been installed by Fluor Daniels, who has done quite a bit of peripheral work on the plant. This well was sampled four times during this investigation for all chemicals.

Background values determined by Fluor Daniel for surface water, sediment, and soil were used in this study. Fluor Daniel collected samples and evaluated results to establish facility-wide background environmental conditions under the RCRA program.

Question: *What depth are the groundwater channels? Is it a shallow and deeper aquifer?*

Response: There are several sand channels at varying depths from at ground surface to about 30 ft below ground surface. Yes, LSAAP characteristically has shallow groundwater, and although it may be perched, there are areas where groundwater levels are as shallow as 6 to 7 ft below ground surface.

Question: *Do you know if these aquifers merge at any point? Do they mix at any time-- did the hydrology indicate that?*

Response: Yes they may be interconnected in areas, but within the Study Area these units are very heterogeneous and discontinuous both vertically and laterally.

Just to the south of the ODA there is a break in slope where the groundwater discharges to the surface. It is a paleochannel sand that is actually feeding the seep, and the uppermost boundary of this sand is probably less than 8 ft below ground surface. It is at the point of intersection where the old stream channel has incised into these sands where there is seepage. The seep is continuous throughout the year.

Question: *Is that water being monitored?*

Response: Yes, sampling of surface water at the seep is part of the long-term monitoring plan for the ODA.

Any concerns TNRCC or EPA has had have been expressed, and both agencies have been involved in formulating the institutional controls that would determine whether or not the presumptive remedy is effective. The monitoring will involve monitoring of existing wells and the possibility of drilling a couple of additional wells. TNRCC has mapped the sands in great detail from the detailed information that was supplied by AGEISS and the on-site cores provided by the Army. The agencies know where the sands are and can explain why certain monitoring wells are dry while others are wet or are better producers. TNRCC and EPA will ensure that there are monitoring wells that monitor the potential contaminants.

Question: *Do you know of any well monitoring off of LSAAP that's been done by this facility or by the government?*

Response: The Army is not aware of any monitoring by the Federal or state government.

PUBLIC COMMENTS RELATED TO LSAAP AND ARMY RESPONSES

Public comments related to LSAAP have been organized in the following categories: General, LSAAP Other Facilities, and Surface Water.

GENERAL

Question: *Who is the contractor?*

Response: AGEISS out of Denver, CO is the contractor who worked for the Army to conduct the Phase IV investigation and prepare the RI, FFS, Proposed Plan, and the ROD. The Army has also had two previous contractors that studied the site, Dames & Moore, and Fluor Daniels.

Question: *Do the contractors have their own laboratory or do you contract that out?*

Response: The contractors subcontract the analytical laboratory. The laboratory subcontracted must be certified by the U.S. Army Environmental Center for the chemical analyses. AGEISS used Environmental Science Engineering in Gainesville, FL for the Phase IV data.

Question: *What is the distinction between the RCRA sites and CERCLA sites?*

Response: RCRA sites are usually active sites and require permits to manage hazardous wastes. CERCLA sites are usually sites that are no longer active but show evidence of historical contamination. The ODA has not been used since 1945. The ODA also meets the criteria to be a NPL site (i.e., a Superfund site). Sites that are listed on the NPL are sites across the country known to exceed a numerical threshold. The numerical threshold is based on gathering data and conducting a mathematical model based on exposure pathways. If the resulting number exceeds a certain threshold, the site is added to the NPL. The ODA is the only NPL site on LSAAP.

LSAAP OTHER FACILITIES

Question: *Is the ODA the only area on the premises that was used for detonation of explosives?*

Response: The ODA is the only area that the Army is aware of that was historically used to detonate explosives during that period of time. LSAAP has an active demolition ground that is located some distance from the ODA. It is a subterranean explosion area and is being used as permitted by the state.

Question: *Are there any other landfills on this facility? Are there any other areas of concern on this facility that may present environmental problems? Are other sites currently being utilized?*

Response: There are a number of landfills on LSAAP. Most of them do not consist of this type of material. They contain construction material from old buildings that have been torn down.

Other sites are either being utilized or investigated. LSAAP comprises 15,500 acres, and the Army has been doing industrial work here for almost 60 years. From an environmental standpoint, there are currently 25 SWMUs that have been identified under the state RCRA regulations. These SWMUs are being addressed under the state RCRA program. Some of these are currently active and some of them are inactive. Some of them are currently under investigation and will be remediated under the state RCRA program. The ODA is the only NPL site on LSAAP. LSAAP does have some additional non-NPL CERCLA sites that have already been cleaned up under the RCRA program, and there are some sites the Army and TNRCC have agreed no action is required.

Question: *Are there any remediation programs in place?*

Response: Yes, there are several that are currently underway at LSAAP under the state RCRA program.

Question: *What are the RCRA sites? Is it true that you have other dump sites within the perimeter of the property that may be of concern?*

Response: LSAAP has multiple sites that fall under the state RCRA program because they have been used in an industrial environment. These RCRA sites may or may not be contaminating the environment enough to require some sort of action. The Army does not believe any of these sites are a threat to anyone off the plant. LSAAP had one site that had potential for off-site contamination, but the Army has drilled two monitoring wells and has not found any contamination. But yet, there are a number of closed landfills, municipal type landfills, and closed construction type landfills. There are a number of industrial areas that are no longer used. Some of the sites the Army is investigating are inside industrial areas that are in use today, but the particular portion under investigation is no longer being used.

LSAAP has over 200 groundwater monitoring wells throughout the entire plant. Probably an additional 200 holes have been drilled that could not be made into wells because there was no water. But valuable data were generated during the drilling. The Army does not want to give the impression that there is only have one site we are concerned about. The Army is concerned about the entire plant. However, various sites fall under a number of different programs, both Federal and state.

LSAAP has a quarterly Technical Review Committee meeting in which the public is able to attend and obtain a status of all the environmental programs. On the Technical Review Committee, LSAAP has a county representative, Judge Carlow. We also have several members from the immediate surrounding areas.

Question: *Are there any more ammo dump sites that were used for demolition purposes over the years?*

Response: No. LSAAP has two that the Army is aware of, the old one called the ODA that is the subject of this ROD, and the one that is currently being used which was established in 1951.

The ODA went out of use after a brief period of use in 1943 to 1944. After the ODA went out of use, the only demolition area that existed for both LSAAP and RRAD was located on RRAD. In 1951 when LSAAP was reactived, LSAAP created a new demolition area, which is the one in use today. The current demolition area is surrounded with monitoring wells, and the Army has monitored the soil, groundwater, surface water, and sediment flow from there.

Question: *Where is all the old powder disposed of? Are those areas also known as demolition areas?*

Response: Normally the Army burns powder, and LSAAP has an area known as a High Explosive Burning Ground that is located close to the current demolition area. These are two separate areas and are permitted separately under the state RCRA program. Burning of powder is not done underground any more; it is done in pans on the ground. That area is also surrounded with monitoring wells and the Army is monitoring that as well, with no indication of a problem.

SURFACE WATER

Question: *Has the Army, EPA, or TNRCC collected any sediment samples down Elliott Creek to and including Lake Wright Patman to determine if there is any contamination in and around the lake?*

Response: The Army has not sampled further south on East Fork Elliott Creek than the conf luence of the drainage from the ODA, because this study was focusing on environmental impacts of the ODA, not the entire plant. The ODA is not adversely impacting East Fork Elliott Creek.

Question: *Please clarify that there was no testing all the way down to Lake Wright Patman? Have any of the officials from the surrounding area ever asked if any sediment samples have ever been tested in and around Lake Wright Patman, soil or the water supply?*

Response: Sampling was not done all the way down East Fork Elliott Creek to Lake Wright Patman. The Army is not aware of any officials from the surrounding areas asking about samples collected in the vicinity of Lake Wright Patman.

As a good neighbor policy, the Army samples water quarterly from every outflowing stream. The Army has also tested sediment from every outflow from the plant. There is no Indication that chemicals have left the plant. The Army has not collected samples from Lake Wright Patman, because there is no indication of the need to do that. Additionally, if the Army did sample south of U.S. Highway

67, there would not necessarily be a direct indication that the chemicals came from LSAAP. There is a lot of land there, with residences and a road. The Army really does not have the authority to sample off of the plant.

The state has drinking water quality functions within TNRCC in Region 5 under which they are required to monitor surface and groundwater supplies every 2 years for water quality parameters. The work that TNRCC conducts is available to the public. As far as TNRCC is aware, there have not been any concentrations of chemicals of concern that have shown up in Lake Wright Patman. The Texas Department of Health also monitors TNRCC's records.

Comment: *My name is Bill King. I'm the director of Texarkana Water Utilities, and I have some knowledge of the testing that's been done by TNRCC on raw and treated water here. There has been no evidence that there has been any findings of elevated concentrations of heavy metals. It would have been much more comfortable had there been some sampling of the sediment in the neck of the lake immediately after Elliott Creek to preclude the possibility that there has been historic instances of either leaching or erosion of materials from the site. Specifically, this is a concern because Texarkana is looking with the Corps of Engineers in the fairly near future at the possibility of dredging in the area of Texarkana's intake along many of those areas, and should there have been historical examples or historic instances of leaching of that type of materials, it might certainly make us look at other evidence.*

Response: As a good neighbor policy, the Army has collected sediment samples from East Fork Elliott Creek as it leaves the plant's boundary, and there is no data that indicate any need to go downstream. The only way that the Army is allowed to go off post to sample is if there is an indication at the plant boundary that contaminants have moved off the plant.

Question: *Most of the testing has taken place post 1980. The leaching or erosion that is of concern would pre-date that when possibly concentrations of metals and other things would have been higher.*

Response: Yes. The initial investigation was done in 1978, with following investigations occurring after 1978. But in 1977 and 1978 the Army collected sediment samples off post with no indication of contamination at that point. In 1979 there were a number of articles in the *Texarkana Gazette* regarding high levels of mercury north of the plant. There was groundwater testing done and nothing was found. Mercury readings were never able to be duplicated.